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An International Forum
on the Diversity of Life on Earth...
research, conservation, education and wise use

Volume 2 ■ Number 1 ■ Spring 1992 ■ Canadian Museum of Nature

The goals of **Canadian Biodiversity** are to:

* ***Publish articles, views and news on biodiversity***

* ***Bridge the gaps between professional disciplines & the public***

* ***Communicate information on Canadian & world biodiversity***

* ***Express views on the needs & value of biodiversity research***

* ***Discuss methods and philosophy of biodiversity conservation***

* ***Review books and major articles on biodiversity***

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Book review editors: Dr. David Jarzen and Ms. Susan Jarzen.
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It would be helpful if longer manuscripts were submitted in Word Perfect 5.1 or ASCII format on either 3½ or 5¼ inch diskettes, with a hard copy printout to show italics, etc., if in ASCII.

Canadian Biodiversity is published quarterly. Annual subscription rates are $25 for individuals and $50 for institutions in Canada (Can$ **not** including GST), United States and other developed countries (U.S.$) and $8 for individuals and $12 for institutions in developing countries.

Version française disponible:
Bulletin canadien de la biodiversité.

ISSN 1183-3254 (English edition).
ISSN 1183-3378 (édition française)

Printed on recycled paper using vegetable oil ink.
Blue ink on cover obtained from New Brunswick blueberries.

JUL 29 1992

CANADIAN MUSEUM OF NATURE
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TABLE OF CONTENTS

WORLD CHARTER FOR NATURE 2

PAPERS 6
Vascular plants likely to be listed as vulnerable or threatened 6
Biodiversity decline - The Australian situation 13
Biodiversity and insect collections 16

VIEWS 23
Helping endangered species: COSEWIC and RENEW. Is this the best that we can do? 23

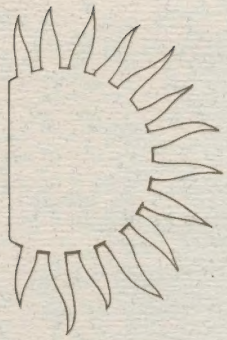
NGO CORNER 31
Blue Planet: Now or never 31
Diverse quotes 33
Planet of the Killer Apes 34

NEWS 35
Biodiversity News Notes 35
Illustration of the Barred Bandicoot, *Parameles bougainville* 38
Biodiversity Meetings 40
Book and Periodical Niche 40

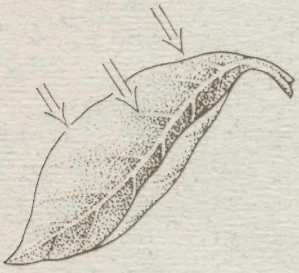
Illustration of Bull Kelp, *Nereocystis leutkeana* 49

Subscription to *Canadian Biodiversity* 52

WORLD CHARTER FOR NATURE



In this, the year of the *Earth Summit*, it seems timely to consider the wise words of **The World Charter for Nature**, adopted and solemnly proclaimed by the General Assembly of the United Nations on the 28th of October 1982.



I. GENERAL PRINCIPLES

1. Nature shall be respected and its essential processes shall not be impaired.
2. The genetic viability on the Earth shall not be compromised; the population levels of all life forms, wild and domesticated, must be at least sufficient for their survival, and to this end necessary habitats shall be safeguarded.
3. All areas of the Earth, both land and sea, shall be subject to these principles of conservation; special protection shall be given to unique areas, to representative samples of all the different types of ecosystems and to the habitats of rare or endangered species.
4. Ecosystems and organisms, as well as the land, marine and atmospheric resources that are utilized by man, shall be managed to achieve and maintain optimum sustainable productivity but not in such a way as to endanger the integrity of those other ecosystems or species with which they coexist.
5. Nature shall be secured against degradation caused by warfare or other hostile activities.

II. FUNCTIONS

6. In the decision-making process it shall be recognized that man's needs can be met only by ensuring the proper functioning of natural systems and by respecting the principles set forth in the present Charter.
7. In the planning and implementation of social and economic development activities, due account shall be taken of the fact that the conservation of nature is an integral part of those activities.
8. In formulating long-term plans for economic development, population growth and the improvement of standards of living, due account shall be taken of the longterm capacity of natural systems to ensure the subsistence and settlement of the population concerned, recognizing that this capacity may be enhanced through science and technology.
9. The allocation of areas of Earth to various uses shall be planned, and due account shall be taken of the physical constraints, the biological productivity and diversity and natural beauty of the areas concerned.
10. Natural resources shall not be wasted, but used with a restraint appropriate to the principles set forth in the present Charter, in accordance with the following rules:

a) Living resources shall not be utilized in excess of their natural capacity for regeneration;

b) The productivity of soils shall be maintained or enhanced through measures which safeguard their long-term fertility and the process of organic decomposition, and prevent erosion and all other forms of degradation;

c) Resources, including water, which are not consumed as they are used, shall be reused or recycled;

d) Non-renewable resources which are consumed as they are used shall be exploited with restraint, taking into account their abundance, the rational possibilities of converting them for consumption, and the compatibility of their exploitation with the functioning of natural systems.

11. Activities which might have an impact on nature shall be controlled, and the best available technologies that minimize significant risks to nature or other adverse effects shall be used; in particular:

a) Activities which are likely to cause irreversible damage to nature shall be avoided;

b) Activities which are likely to pose a significant risk to nature shall be preceded by exhaustive examination; their proponents shall demonstrate that expected benefits outweigh potential damage to nature, and where potential adverse effects are not truly understood, the activities should not proceed;

c) Activities which may disturb nature shall be preceded by assessment of their consequences, and environmental impact studies of development projects shall be conducted sufficiently in advance, and if they are to be undertaken, such activities shall be planned and carried out so as to minimize potential adverse effects;

d) Agriculture, grazing, forestry and fisheries practices shall be adapted to the natural characteristics and constraints of given areas;

e) Areas degraded by human activities shall be rehabilitated for purposes in accord with their natural potential and compatible with the well-being of affected populations.

12. Discharge of pollutants into natural systems shall be avoided and:

a) Where this is not feasible, such pollutants shall be treated at the source, using the best practical means available;

b) Special precautions shall be taken to prevent discharge of radioactive or toxic wastes.

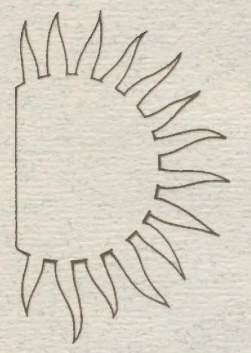
13. Measures intended to prevent, control or limit natural disasters, infestations and diseases shall be specifically directed to the causes of these scourges and shall avoid adverse side-effects on nature.

III. IMPLEMENTATION

14. The principles set forth in the present Charter shall be reflected in the law and practice of each State, as well as at the international level.

15. Knowledge of nature shall be broadly interpreted by all possible means, particularly by ecological education as an integral part of general education.

16. All planning shall include, among its essential elements, the formulation of strategies for the conservation of nature, the establishment of inventories of ecosystems and assessments of the effects on nature of proposed policies and



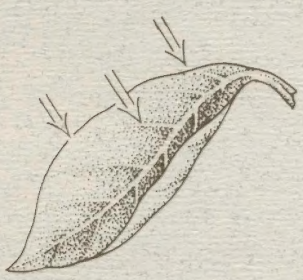
activities; all of these elements shall be disclosed to the public by appropriate means in time to permit effective consultation and participation.

17. Funds, programs and administrative structures necessary to achieve the objectives of the conservation of nature shall be provided.

18. Constant efforts shall be made to increase knowledge of nature by scientific research and to disseminate such knowledge unimpeded by restriction of any kind.

19. The status of natural processes, ecosystems and species shall be closely monitored to enable early detection of degradation or threat, ensure timely intervention and facilitate the evaluation of conservation policies and methods.

20. Military activities damaging to nature shall be avoided.



21. States and, to the extent they are able, other public authorities, international organizations, individuals, groups and corporations shall:

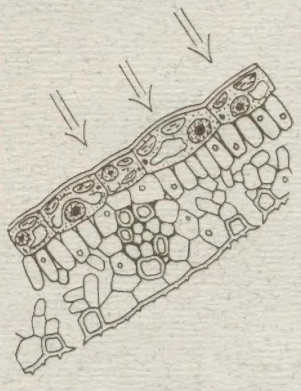
a) Co-operate in the task of conserving nature through common activities and other relevant actions, including information exchanged and consultations;

b) Establish standards for products and manufacturing processes that may have adverse effects on nature, as well as agreed methodologies for assessing these affects;

c) Implement the applicable international legal provisions for the conservation of nature and the protection of the environment;

d) Ensure the activities within their jurisdictions or control do not cause damage to the natural systems located within other States or in the areas beyond the limits of national jurisdiction;

e) Safeguard and conserve nature in areas beyond national jurisdiction.



22. Taking fully into account the sovereignty of States over their natural resources, each State shall give effect to the provisions of the present Charter through its competent organs and in cooperation with other States.

23. All persons, in accordance with their national legislation, shall have the opportunity to participate, individually or with others, in the formulation of decisions of direct concern to their environment, and shall have access to means of address when their environment has suffered damage or degradation.

24. Each person has a duty to act in accordance with the provisions of the present Charter, acting individually, in association with others or through participation in the political process, each person shall strive to ensure that the objectives and requirements of the present Charter are met.

The General Assembly of the United Nations

Reaffirming the fundamental purposes of the United Nations, in particular the maintenance of international peace and security, the development of friendly relations among nations and the achievement of international co-operation in solving international problems of an economic, social, cultural, technical, intellectual or humanitarian character,

Aware that:

a) Mankind is a part of nature and life depends on the uninterrupted functioning of natural systems which ensure the supply of energy and nutrients,

b) Civilization is rooted in nature, which has shaped human culture and influenced artistic and scientific achievement, and living in harmony with nature gives man the best opportunities for the development of his creativity, and for rest and recreation.

Convinced that:

a) Every form of life is unique, warranting respect regardless of its worth to man, and, to accord other organisms such recognition man, must be guided by a moral code of action,

b) Man can alter nature and exhaust natural resources by his action or its consequences and, therefore, must fully recognize the urgency of maintaining the stability and quality of nature and of conserving natural resources.

Persuaded that:

a) Lasting benefits from nature depend upon maintenance of essential ecological processes and life support systems, and upon the diversity of life forms, which are jeopardized through excessive exploitation and habitat destruction by man,

b) The degradation of natural systems owing to excessive consumption and misuse of natural resources, as well as the failure to establish and appropriate economic order among peoples and among States, leads to a breakdown of the economic, social and political framework of civilization,

c) Competition for scarce resources creates conflicts, whereas the conservation of nature and natural resources contributes to justice and the maintenance of peace and cannot be achieved until mankind learns to live in peace and to forsake war and armaments.

Reaffirming that man must acquire the knowledge to maintain and enhance his ability to use natural resources in a manner which ensures the preservation of the species and ecosystems for the benefit of present and future generations.

Firmly convinced of the need for appropriate measures, at the national and international, individual and collective, and private and public levels, to protect nature and promote international cooperation in this field.

Adopts, to these ends, the present World Charter for Nature, which proclaims the following principles of conservation by which all human conduct affecting nature is to be regarded and judged.

~ ~ ~ ~ ~

PAPERS

Vascular plants likely to be listed as vulnerable or threatened in Québec

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PROTÉGER LA FAUNE ET LA FLORE MENACÉES
...C'EST DANS MA NATURE

INTRODUCTION

The aim of the ***Act respecting threatened or vulnerable species*** enacted in Québec in June 1989 is to safeguard the global genetic diversity found in that province. It therefore applies to all living species and their habitat. According to the legislation, a "species" can also mean a sub-species, a variety, a race or a geographically isolated population. Its specific aim is to avoid a population decrease of threatened or vulnerable species, guarantee the protection of their habitat, restore the populations and the habitats of the species concerned and avoid a species becoming threatened or vulnerable. The Ministère de l'Environnement du Québec is responsible for the implementation and management of the legislation applying to the flora and the Ministère du Loisir, de la Chasse et de la Pêche, to the fauna.

The ***Bill respecting threatened or vulnerable species*** (Ministère de l'Environnement et Ministère du Loisir, de la Chasse et de la Pêche, 1991) recognizes the following statuses:

Threatened species: any species whose disappearance is likely; and

Vulnerable species: any species whose survival is precarious even though its disappearance is not likely.

It is worth mentioning at this point that the "threatened species" status in Québec includes the "endangered species" status and "threatened species" status found in American and other Canadian provinces legislation. Furthermore, the "vulnerable species" status is not officially recognized in American legislation and is not acknowledged in other Canadian provincial laws. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) nevertheless has used it since 1989. The allocation of an official status to a species will be through regulations. To this effect, two scientific advisory committees will be created in 1992 to help the departments deal with issues concerning the fauna and flora.

The Act prescribes preventive measures for species that are "susceptible" to become threatened or vulnerable. These measures include research, studies or analyses, creation of survival programs and management delegation, protection and development of species habitat, and the signing of agreements with individuals, organizations or governments in order to attain the goals set forth in the Act. The Ministère de l'Environnement can also rent or buy any capital personal property or real estate and accept any gift or bequest of buildings or real estate.

Publishing a list of species likely to become threatened or vulnerable and the implementation of preventive measures concerning them, coupled with the need to consider them in the context of the analysis of projects subject to environmental impact assessments, should contribute to guarantee the survival of many species. In this way, the more official process of legal status designation could be reserved for "umbrella" species and those that require a more rigid protection frame.

The Ministère de l'Environnement du Québec has drawn up such a list of vascular plant species likely to become designated as threatened or vulnerable. It has also published a background paper (Lavoie 1992) on the legislative context mentioned earlier, the species selection process and the plants concerned in the context of the make-up of the flora, their distributional regime, their habitat and their distribution in Québec. These last two aspects are summarized below.

SELECTION OF VASCULAR PLANT SPECIES LIKELY TO BE DESIGNATED AS THREATENED OR VULNERABLE

The selection of vascular plant species likely to be designated as threatened or vulnerable is based on the currently available data: inventoried herbarium specimens and other data integrated to date at the **Centre de données sur le patrimoine naturel du Québec** (Ministère de l'Environnement du Québec) affiliated with the data centre network of The Nature Conservancy; information collected from published documents, in particular the Québec rare plants list (Bouchard *et al.*, 1983), the rare plants of Canada (Argus and Pryer, 1990), COSEWIC reports (10 species) and various books on the local flora, recently published articles and monographs; and personal communications with botanists.

The evaluation and selection criteria chosen are based in part on those developed by certain New England states and those used by The Nature Conservancy (1988) to establish priority status for conservation. For each species, the evaluation and selection criteria take into account its nativeness, the number of collection sites in Québec, its distribution, how rare it is at the national level, current and potential threats, the susceptibility of the populations, population numbers and taxonomic status. The various status levels adopted by the government of Québec, the particular biogeographical context, the uneven distribution in the province and the often historical nature of the data have also been taken into consideration. The selected species and the selection criteria have been evaluated by expert botanists.

PROTÉGER LA FAUNE ET LA FLORE MENACÉES
...C'EST DANS MA NATURE

PROFILE OF VASCULAR PLANTS LIKELY TO BE DESIGNATED AS THREATENED OR VULNERABLE

1) Make-up of the flora

On the basis of the selected criteria, 374 vascular plants species are considered likely to be designated as threatened or vulnerable in Québec. This represents 20% of the indigenous flora (1850 species) of the province. Fifteen species have been chosen to be so designated in only part of their geographical range, i.e. isolated populations.

The number of trees, shrubs and herbaceous plants is proportional to their importance as part of the vascular flora of Québec, the last ones being the most abundant (91%, Figure 1). The same applies to the taxonomic groups found in the province: Dicotyledons come first, followed by Monocotyledons, Pteridophytes and Gymnosperms (Figure 1). Much the same can be said about the plant families: Cyperaceae, Poaceae (Gramineae) and Asteraceae (Composaceae).

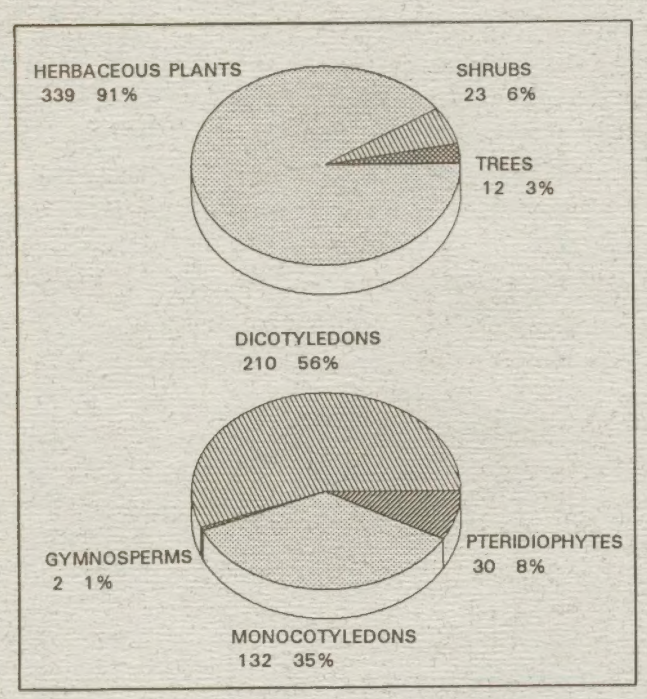


Figure 1. Trees, shrubs and herbaceous plants and taxonomic class or division of the vascular plants likely to be designated as threatened or vulnerable in Québec.

2) Distributional patterns

Almost all the vascular plant species likely to be designated as threatened or vulnerable are so because they are naturally rare, a fact that can be tied to certain distributional patterns, four of which have been considered (Figure 2).

Peripheral species: Numerous plant species are found in Québec at the limits of their global range. Two thirds of the vascular plants likely to be designated as threatened or vulnerable can be associated with that type of geographic distribution. In the majority of cases (83%), it is the northern limit of the range.

Disjunct species: Of the selected species, 15% are characterized by their isolation from the main range. It is often a residual range resulting from the environmental modifications left in the path of receeding glaciers more than 10,000 years ago.

Sporadic species: Of the selected species, 10% have a vast range but are scattered, at least in Québec. This group is similar to the preceeding one and could, if the need so arises, be incorporated into it.

Endemic species: Because their range is restricted to Québec and Canada or the neighboring American states, and because they are relatively rare, 38 species (or 10% of the selected species and 2% of the endemic flora) are considered endemic. Two thirds of these are restricted to the estuary and Gulf of St.Lawrence (including the Gaspé Peninsula). Twelve of them are not found outside Québec (Table 1) and nine have been collected in only one other province, in this case Newfoundland. Because Québec's endemic species are relative newcomers (post-glacial era), their differentiation is not complete and their taxonomic status is doubtful in certain cases, or has only recently been recognized. Furthermore, the low number of biological studies carried out does not warrant a final assessment.

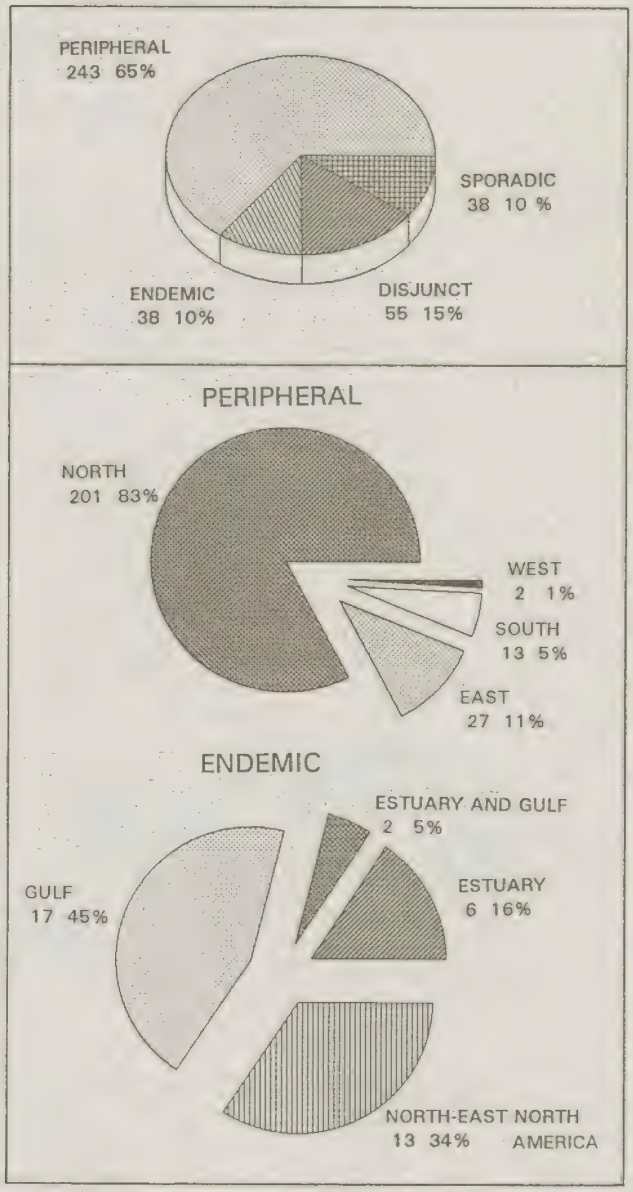


Figure 2. Vascular plants likely to be designated as threatened or vulnerable in Québec according to their distributional patterns.

St.Lawrence River Estuary	
Cicuta maculata var. *victorinii*	*Lycopus americanus* var. *laurentianus*
Gentianopsis victorinii	*Zizania aquatica* var. *brevis*
Gratiola neglecta var. *glaberrima*	
Tidal Estuary and Gulf of St.Lawrence	
Rosa rousseauiorum	*Rosa williamsii*
Gulf of St.Lawrence	
Cirsium foliosum var. *minganense*	*Salix chlorolepis*
Draba peasei	*Solidago simplex* ssp. *simplex* var. *chlorolepis*
Cypripedium passerinum var. *minganense*	

Table 1. Endemic vascular plants of the estuary and Gulf of St. Lawrence found only in Québec.

3) Habitat and substrate preference

The analysis of the data currently available on the habitat of vascular plants likely to be designated as threatened or vulnerable reveals that they are more abundant in open environments, herbaceous or shrubby, and in a relatively similar manner, in terrestrial and marshy environments (Figure 3). River banks, deciduous forests and rocky terrain are among the most important.

More than 25% of the selected vascular plants prefer a calcareous substrate. That percentage reaches 55% in the case of endemic species. Ten species, of which four are endemic, are found only or partly on serpentine outcrops.

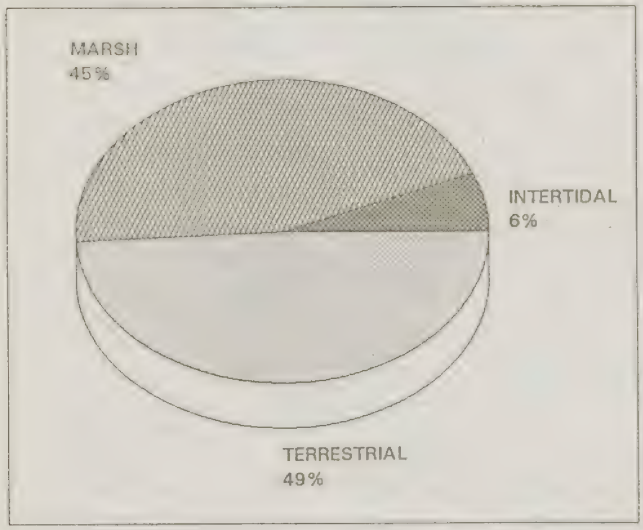


Figure 3. Relative frequency of the habitat groups of the vascular plants likely to be designated as threatened or vulnerable in Québec.

4) Range in Québec

The data on the range of vascular plants have been interpreted in terms of provincial administrative regions (Figure 4). Eventually, they will be interpreted at a more finite level in order to insure better species management.

The more southerly administrative regions, that is those included in the Ottawa-Lake St-Pierre-Richelieu triangle, cover almost 60% of the selected species, for the most part species at the northern limit of their range. It is in that part of the territory that biodiversity is at its highest and where the environmental pressures are the most acute because of the high degree of urban, and agricultural and industrial development. These areas are therefore the habitat of a large number of exclusive species compared to the rest of the territory. It is also the case in the northern part of the province, the Gaspé peninsula, the Magdalen Islands and the North Shore where isolated species are mainly found. These last two areas are also the habitat of most of the endemic species, mostly calciphile plants. Serpentiniphile species are restricted to serpentine outcrops of the Appalachian Mountains, at Mount Albert in the Gaspé Peninsula and the neighbouring areas of Thetford Mines and Asbestos, more precisely in the Chaudière-Appalaches area and the Estrie respectively.

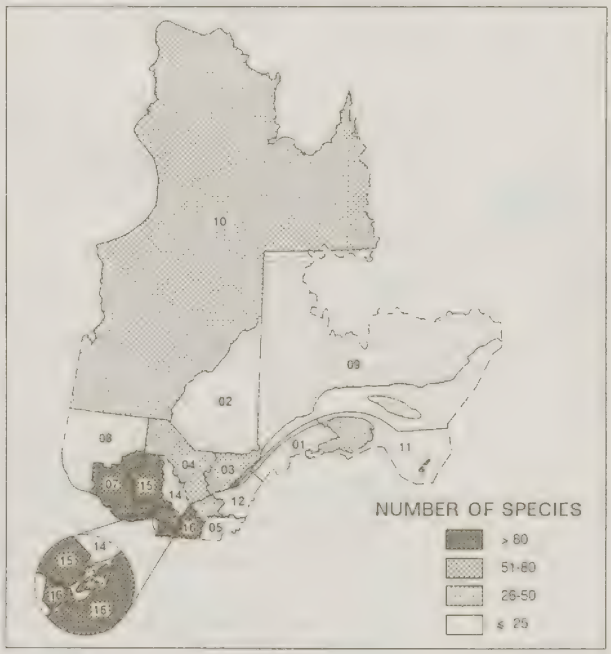


Figure 4. Importance of vascular plants likely to be designated as threatened or vulnerable in Québec according to the administrative regions.

More than 50% (219 species) of the vascular plants likely to be designated as threatened or vulnerable have been collected only at five sites in Québec or in the territory inhabited by the concerned population. Three species of vascular plants are extinct; the first two at the national level and the last one (a species endemic to Québec), in its whole range (Table 2). Many of these species have been collected more than 25 years ago. Nine of

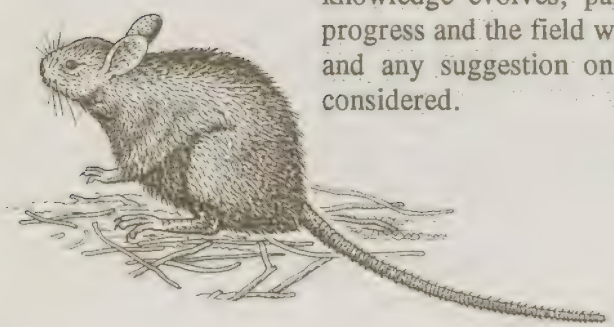
them have not been found again in spite of collecting efforts; their presence in Québec is therefore considered historical (Table 2). The Montréal Archipelago sets itself apart in that sense. That area has been the most altered by human activities; the habitats of certain areas rich in species, namely Nuns' Island, St. Helen's Island, Mount Royal and the whole of the river banks have been destroyed or altered through building and landfill activities.

	ADMINISTRATIVE REGIONS					DISTRICT
HISTORICAL SPECIES	05	06	11	13	16	
Agrimonia pubescens		■				Mont-Royal
Carex atherodes		■				Sainte-Anne-de-Bellevue
Chamaesyce polygonifolia			■			Cap-aux-Meules
Geranium maculatum					■	Île Perrot
Hydrophyllum canadense	■					Johnville
Lipocarpa micrantha					■	Baie Missisquoi
Rhus glabra					■	Farnham
Sporobulus asper var. *asper*		■				Île des Soeurs
Verbena simplex		■		■		Rivière des Prairies, îles des Soeurs et Sainte-Hélène (disparue)
EXTINCT SPECIES						
Blephilia hirsuta var. *hirsuta*					■	(Dunham) Brome
Draba peasei			■			Mont Saint-Alban (Forillon)
Oenothera fruticosa ssp. *glauca*		■	■			Montréal

Table 2. Vascular plants extinct or historically present in Québec.

CONCLUSION

This paper is intended to be an administrative and educational tool in order to implement the goals of the ***Act respecting threatened or vulnerable species***. It is the first assessment of the knowledge on the taxonomy, abundance, habitat and range of the vascular plants likely to be listed as threatened or vulnerable. The number of selected species reflects the inclusion of the vulnerable status, not found in most of the current legislation, and the preventive nature of the list. It is likely that species will be added and removed as our knowledge evolves, particularly with the completion of the herbarium inventory in progress and the field work being carried out. The list will be updated from time to time and any suggestion on the addition or removal of a species from the list will be considered.



Canadian Museum of Nature

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The free document **"Plantes vasculaires susceptibles d'être désignées menacées ou vulnérables au Québec"** is available in French at the following address:

Direction des communications
Ministère de l'Environnement du Québec
3900, rue Marly, 6e étage
Sainte-Foy, Québec G1X 4E4, Canada

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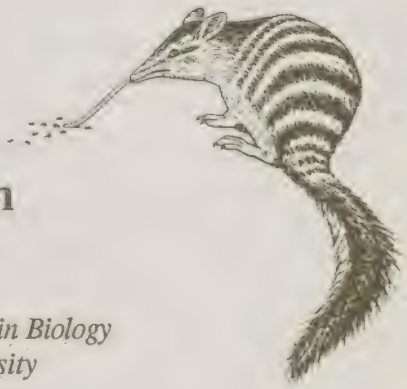

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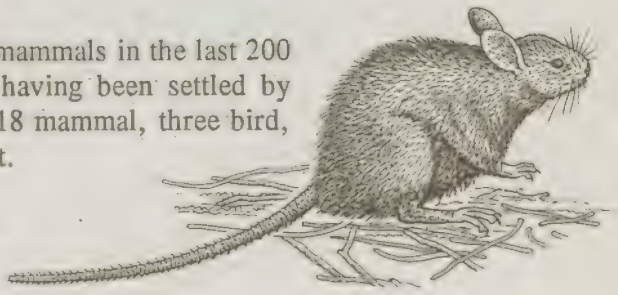
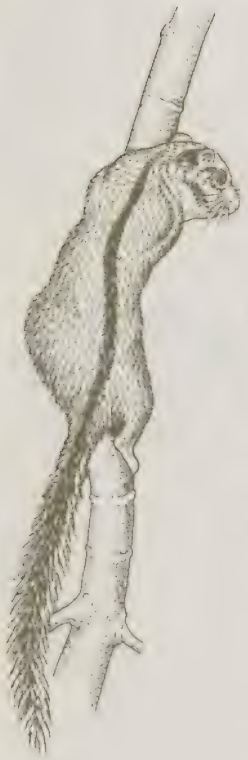
Australia



Australia has the unenviable claim to have lost more species of mammals in the last 200 years than any other continent. Thus, in spite of our land having been settled by Europeans for a much shorter period than elsewhere, we have 18 mammal, three bird, and one reptile species which are known to have become extinct.

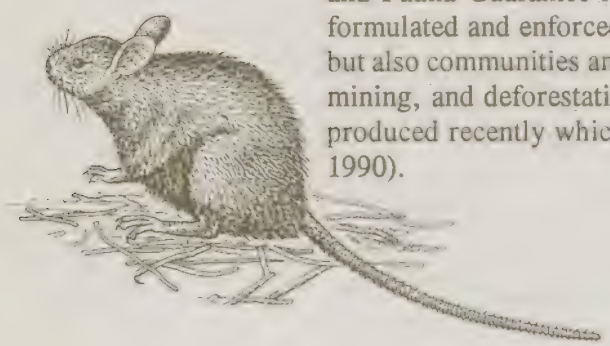
Various reasons have been proposed for this high rate of extinction, including:

- Competition for food from introduced herbivores (mainly cattle and rabbits)
- Compaction of friable soils by hard-hoofed stock
- Erosion caused by overgrazing and ripping of vegetation from sandy soils
- Altered fire regime which has accompanied a change in life style of our Koori (aboriginal) peoples
- Intensive predation of vulnerable populations by introduced carnivores - especially the Red Fox, *Vulpes vulpes*. (One of the last two remaining colonies of the Rufous Hare-wallaby, *Lagorchestes hirsutus*, was recently eradicated by what is thought to have been a single fox)
- Habitat fragmentation (especially clearing of forest and woodland for agriculture)
- Direct exploitation (e.g. hunting of the Toolache Wallaby, *Macropus greyi*).



Burbidge and McKenzie (1989) have discovered that many of the extinct mammals fall within a critical weight range of between 35 and 5500 grams. They have proposed a number of reasons for extinction targeting this group of mammals more than small or large species. Many such reasons are covered in the list above. It can also be somewhat simplistically explained by small mammals managing to escape the worst effects of habitat modification and competition (e.g. the burrowing species of genera such as *Notomys*), while larger species (e.g. *Macropus*) are sufficiently mobile to seek out refuges.

Fortunately governments, non-governmental organizations and research groups have recognized the seriousness of the decline in biodiversity in Australia. The Australian government has recently established the Endangered Species Unit administered by the Australian National Parks and Wildlife Service; this Unit sponsors research into threatened species' conservation and management. The IUCN's Action Plan for Australasian Marsupials and Monotremes established actual procedures to be carried out to ensure conservation of many of our endemic mammals. Zoos, universities and State wildlife research agencies are involved in captive breeding programs of endangered species, and successful reintroductions have already been carried out for such mammals as Leadbeater's Possum (*Gymnobelideus leadbeateri*), Rufous Hare-wallaby, Greater Sticknest Rat (*Leporillus conditor*), Bilby (*Macrotis lagotis*), and Numbat (*Myrmecobius fasciatus*). Critical habitat has been purchased by governments to help save such species as the Bridled Nailtail Wallaby (*Onychogalea fraenata*), and the Northern Hairy-nosed Wombat (*Lasiorhinus hirsutus*). Legislation has been introduced to help preserve biodiversity. For instance, the Victorian government introduced its far-reaching Flora and Fauna Guarantee Act in 1988. Species at risk are listed and management actions formulated and enforced. The legislation is unique, since not only can species be listed, but also communities and habitats, and potentially threatening processes such as pollution, mining, and deforestation. As well, there have been a number of excellent publications produced recently which publicize the decline in biodiversity in Australia (e.g. Kennedy 1990).



The need for solid taxonomic and geographic knowledge is often overlooked in conservation. This is being addressed in Australia by the publication of the *Zoological Catalogue of Australia*. Volumes have appeared on the Mammalia, Amphibia and Reptilia, Pisces, Hymenoptera (Part 1), Coleoptera, Arachnida (Part 1), and Ephemeroptera.

Education about the decline in biodiversity is crucial. At the Rusden Campus of Deakin University, the Biology program begins with an analysis of this very issue. Students are also asked to research the conservation history, current status and management options for threatened Australian species. Our library has developed a large collection of references on threatened species conservation (particularly Australian), and we have recently published a bibliography which lists over 3,000 references concerning over 400 threatened species, most of which are Australian (Slattery and Wallis 1991). Readers who would like to purchase a copy of the bibliography should forward a cheque (or institutional order) for C$23 to:

Mr. Michael Holmes
Threatened Species Bibliography
Deakin University - Rusden Campus
Clayton, Victoria. 3168
AUSTRALIA

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Biodiversity and insect collections

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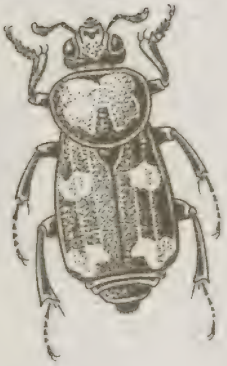
ABSTRACT

Insect collections are resources of obvious and immediate value for reference, research, and education; however, the real importance of collections goes far beyond their immediate utility as research tools and educational resources. Major insect collections are critically important for their role in documenting and understanding biodiversity. This review outlines the essential roles collections can play in the study of biodiversity.

BIODIVERSITY

The greatest crisis facing mankind today is the loss of global biodiversity, of which the most general aspect is the loss of species. Whatever the cause -- overpopulation, climate change, habitat destruction, stupidity, or the fatal combination thereof -- we cannot be reminded too often that the fabric that holds our living planet together is losing threads daily. Current estimates suggest that we will lose 25-50% of living species in the next 25-50 years. Much has been written about the loss of biodiversity and the concomitant potential loss of medicinally or agriculturally valuable species. Such easily understandable losses persuasively argue for the importance of preserving biodiversity, but biodiversity is much more than a storehouse of potentially exploitable species. One of the best illustrations of this point was given by Ehrlich and Ehrlich (1981), who compared our planet to an airplane, held together by an intricate pattern of rivets, which were being removed one by one. When a concerned passenger complained, he was told that each little rivet was unimportant and that he shouldn't worry, because many rivets had already been removed and the plane could still fly! The rivets, of course, are species, and we will crash if we keep losing them at current rates. Remarkably, we don't really know too much about most of the rivets or the logical pattern in which they are inserted. We don't even know to the nearest order of magnitude how many rivets there are!



TSETSE FLY
Glossina pallidipes ♀

Canadian Museum of Nature

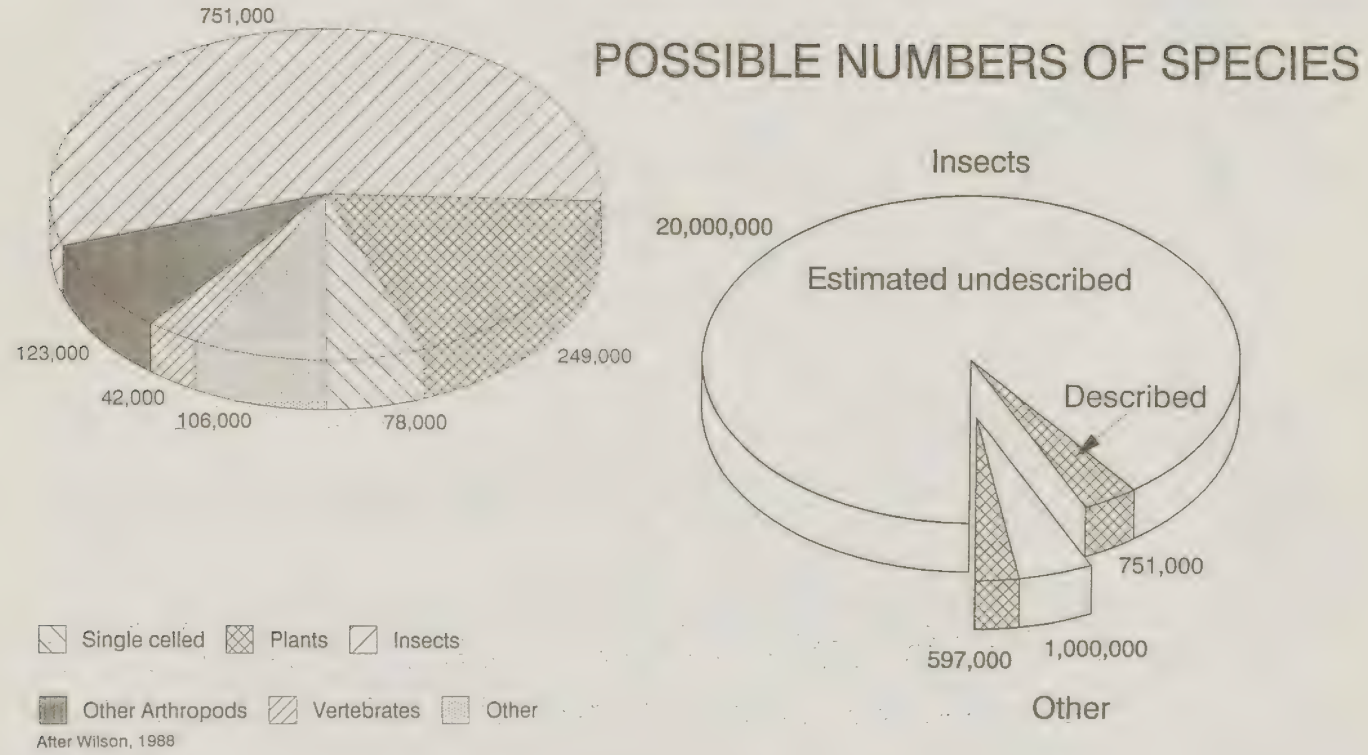
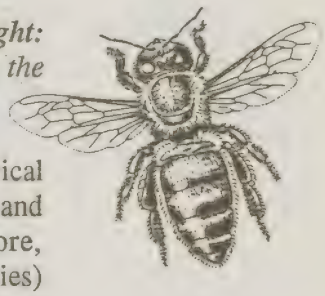
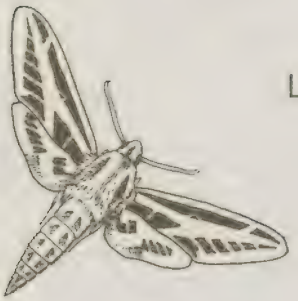
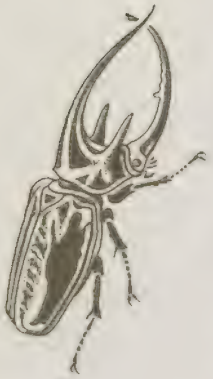


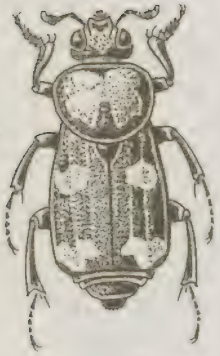
Fig. 1. ***Left:*** *Most of the described species of living organisms are insects and* ***Right:*** *if you accept recent estimates of the number of insect species still unnamed, then the picture is even more impressive (after Wilson 1988).*



Everybody is familiar with the frightening situation in the world's shrinking tropical forests. Not everyone realizes that even here in Canada, a relatively well known and rivet-poor part of the plane, we can only estimate the number of rivets. Furthermore, most of those we know much about are big shiny rivets (conspicuous or common species) and a few rivets which conspicuously annoy us if they shake out of the norm (pest species). Let's stop talking about rivets and start talking about species, in particular about insect species, because insects make up the bulk of the living world. Most described species are insects, and if you accept recent estimates of the number of insect species still unnamed, then the picture is even more impressive. To a large extent, the study of biodiversity is the study of insect diversity, a task utterly dependent on good insect collections.







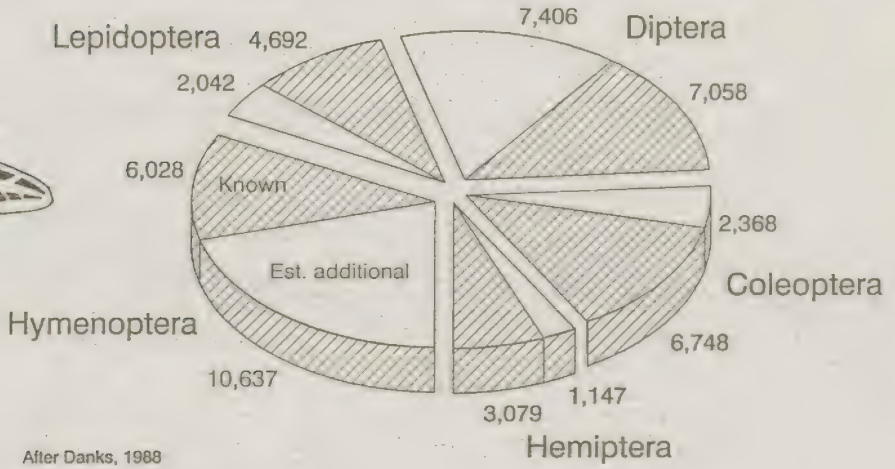


Fig. 2. Only about half of Canada's estimated 66,610 species of insects are described or formally recorded (after Danks 1988).

ENTOMOLOGISTS AND THE BIODIVERSITY CRISIS

Only about half of Canada's estimated 66,610 species of insects are described or formally recorded (Danks, 1988), and only a fraction of these species have been placed in a useful biosystematic context. These embarrassing figures become highly relevant as we set out to assess biodiversity in Canada, because they show that we don't know what we have got, we don't know what we are losing, we can't really say what we have already lost, and what we do know is frequently not in a useful context. The need to assess biodiversity can be likened to a company's need to assess its assets, especially if bankruptcy lurks around the corner. A first priority in addressing an impending bankruptcy is to inventory your assets -- know what you have got, understand the nature of each asset, know where it is, and know where it came from and where it is going. The urgency of such an inventory of the continent's biotic wealth was recognized in a report to the National Science Board in the United States. This recently published report (Black *et al.*, 1990) overviewed the biodiversity crisis and reiterated the urgency of getting a firmer grasp on just what biodiversity is. The first recommendation of this report was that "NSF should, as a matter of National Science Board Policy, provide leadership to undertake the inventory of the world's biodiversity. We recommend that support of biotic inventories be significantly expanded ... with initial funding of $5 million annually, climbing to about $20 million". The report further recognized that the number of systematics graduate students has declined substantially in the past few years, and pointed out the specific need for opportunities for predoctoral and postdoctoral training in systematics.

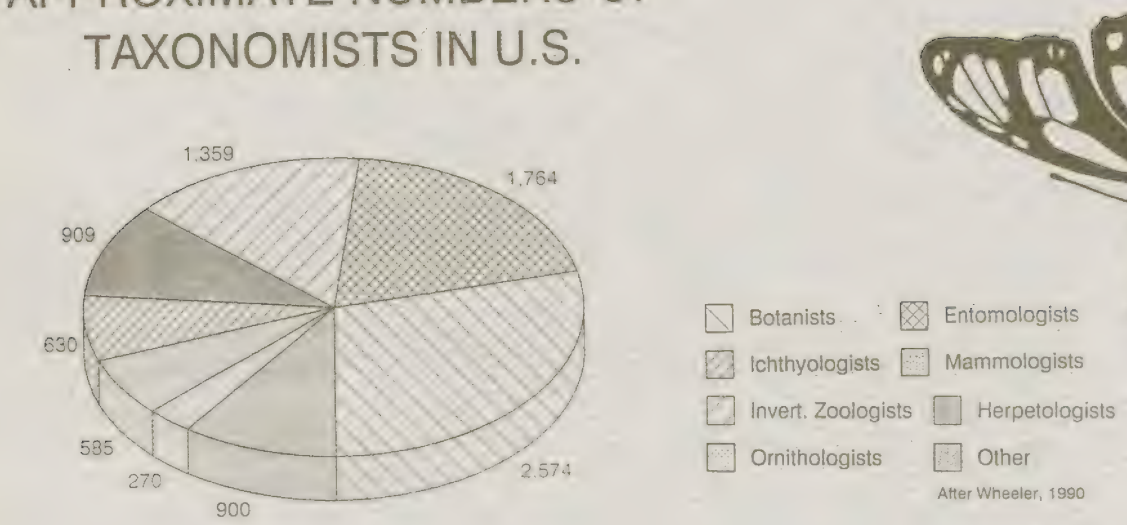
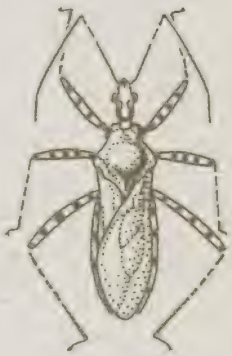


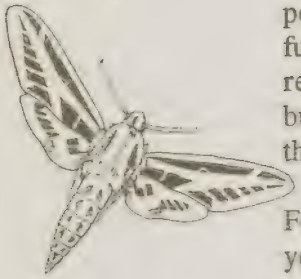
Fig. 3. Not even in the most popular insect orders, such as Coleoptera (beetles) and Lepidoptera (butterflies and moths), are there enough employed systematists to train the next generation of systematists urgently needed if we are serious about understanding biodiversity.



The current shortage of systematists is a very real impediment to seriously addressing global biodiversity. No amount of money will result in satisfactory biodiversity studies in the absence of an adequate systematic framework, which will take years of effort by trained systematists to develop. But where are these trained systematists? Another recent American report, Systematics of the North American Insects and Arachnids: Status and Needs (Kostarab and Schaefer, eds., 1990) paints a grim picture of a systematics community that has been allowed to atrophy at a time when the need for it is greatest. Let me quote from the Diptera chapter in that book, bearing in mind that Diptera is probably the largest order of animals, with an estimated 56,000 North American species (Schaefer and Kostarab, 1991) and 15,000 or so species in Canada alone (Danks, 1988). I quote: "The future for human resources in Diptera is poor. We are not training many new dipterists. We have lost by retirement those key teachers, such as Alexander of Massachusetts, Berg of Cornell, Byers of Kansas, Cook of Minnesota, Schlinger of California, Hardy of Hawaii, who had trained this generation of dipterists. Only the University of Guelph, the Biosystematics Research Centre in Ottawa (Monty Wood, in association with Carleton University), and the Maryland Center for Systematics utilizing the Dipterists in Washington, have active programs for training dipterists. The future of the program at the University of Alberta, where George Ball worked with Doug Craig and Graham Griffiths to train a core of dipterists, is uncertain pending Ball's replacement" (Thompson, 1990). Since those words were written the Biosystematics Research Centre has diminished in manpower and in fact has ceased to exist as a separate entity, and the University of Alberta has decided not to replace Dr. Ball with a

systematist. This shortsighted trend away from systematics, and away from whole-organism biology in general, seriously compromises our ability to study biodiversity now or in the near future. We are short on manpower and infrastructure for almost all groups of insects, and not even in the most popular orders, such as Coleoptera and Lepidoptera, are there enough employed systematists to train the next generation of systematists urgently needed if we are serious about understanding biodiversity.

E.O. Wilson has repeatedly pointed out that we must get serious about inventory of biodiversity. He estimates that the lifetime efforts of 25,000 taxonomists would be entirely consumed merely to inventory the world's entire flora and fauna, and argues that training such a cadre of taxonomists should begin immediately (Wilson, 1985). Unfortunately, even if the needed $2 billion or so was available (an insignificant sum compared to many less important expenditures such as military budgets), the infrastructure just isn't there.. It would take decades of optimum funding to train the dipterists we need just to inventory the world's fly fauna, and thousands of man-years of systematic research to produce the needed framework of systematic revisions. Some people are so discouraged with this state of affairs that they argue that the available funding for biodiversity studies should go to regional surveys, with emphasis on the relatively few taxa for which a reasonably good framework does exist, such as the butterflies. I disagree personally with that kind of shortsighted view, but whichever way the wind blows, insect collections will continue to play a key role.



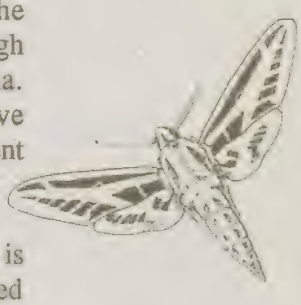
For one thing, given current extinction rates, thousands of species are going extinct every year. Unless they are represented in insect collections, they will be pieces of the global puzzle lost to science in every way. Collections, then, serve as a repository for the majority of insect species which we just can't deal with right now because the current ratio of insect species to systematists is so impossibly high. The ratio of described American insects to American entomologists is about 400:1. This is quite a plateful for each specialist in itself, but a more realistic ratio can be obtained by comparing the estimated number of undescribed species to each entomologist. That figure would be about 28,000:1 according to one estimate (Wheeler, 1990). This ratio necessitates that collections serve as banks of untapped data, but insect collections are much more than just an entomological library waiting to be read. They also serve as the foundation for all current and future studies of biodiversity, from regional surveys to monographic revisions. From a Canadian perspective, our insect collections represent our participation in the task of documenting the biota of the world (Wiggins *et al.*, 1991).

INSECT COLLECTIONS AND BIODIVERSITY STUDIES

Biological survey work typically has three major components: 1) Collect and prepare the specimens; 2) Get the specimens identified; 3) Use information on distribution, biology, and relationships to make meaningful extrapolations from the resultant list of names. Steps 2) and 3) are both *directly* and *indirectly* dependent on insect collections. *Direct* dependence refers to a dependence on data available in collections and nowhere else. Adequate keys, distributional data, and ecological data are published for relatively few groups. Frequently, the only way to reliably identify an insect is to compare it with a

specialist-determined specimen in a museum. Even more frequently, the only way to find out where and when a species occurs is to retrieve data from specimen labels in a good collection.

An older collection can sometimes add otherwise unobtainable information about past distributions of species in areas that have been altered since collections were first made. For example, the University of Guelph collection has southern Ontario records of some species which apparently no longer occur in Ontario, such as the giant silphid *Nicrophorus americanus* Olivier, the extirpation of which is pretty well documented, and polystoechotid lacewings, which seem to have disappeared about 40 years ago. Collections can also be used to track the history of introduced species, such as the European hornet *Vespa crabro* L., or species which are just now expanding their range into Ontario, such as *Leptoglossus occidentalis* Heidemann. *Leptoglossus occidentalis* is a large leaf footed bug which has expanded its originally western range, and which has become common in Ontario only in the last 5 years. In addition to specimens of large, obvious insects such as leaf footed bugs, carrion beetles, and yellowjacket wasps, collections are replete with significant records of more obscure taxa. The University of Guelph collection, for example, includes a micropezid fly in the genus *Raineria*, which had not been recorded in Canada prior to the collection of one specimen in Essex County a few years ago. Even though micropezids are relatively large and distinctive, I would hesitate to say that this specimen represents a range extension, like that of *Leptoglossus*. In contrast to the giant hornet and leaf footed bug, which are tracked well in the collection, micropezid flies and most other insects have not yet been well enough collected to claim that absences in the insect collections represent absences in our fauna. Collections remain the best database we have however, and it behooves us to improve them for future use. We desperately need a more complete inventory of our present biodiversity.



Direct dependence on insect collections for identifications, range, and biological data is obviously important. **Indirect** dependence on insect collections is less widely appreciated and infinitely more important. If a recent revision is used to identify specimens or ascertain ranges or biology, it should be remembered that revisions are invariably based on specimens borrowed from available insect collections, and are only as good as the collections on which they are based. If a specialist is available to identify specimens for a biological survey, that specialist has been trained in systematics through graduate work at a university with a major insect collection, he or she might be using published revisions (based on collection material), and he or she is probably confirming the identifications using the insect collection where he or she works.

For a few taxonomic groups, modern phylogenetic revisions may be available which will allow consideration of survey data in an evolutionary framework. Dobzhansky once pointed out that nothing in biology makes sense except considered in the light of evolution. I agree, and would add that one cannot consider evolution above the species level without phylogenetic information, so I would say that nothing in biology makes sense outside a phylogenetic context. That holds especially for studies of biodiversity. A phylogenetic context can only be the result of taxonomic revisions, done by systematists who depend on collections.

All biotic survey work, then, is ultimately dependent on collections. There is a direct dependence on insect collections for reference or data retrieval and an indirect dependence on collections because systematists, and systematics, depend on collections. Systematics provides both the practical and theoretical framework for biodiversity studies.

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VIEWS

The Earth Summit

"The Summit will be one of the largest and most important conferences in history, attended by representatives of nearly all the member countries of the United Nations."

Jean Charest
Environment Minister,
Canada

Helping endangered species: COSEWIC and RENEW. Is this the best that we can do?

Jacques Prescott and *B. Theresa Aniskowicz*
Jardin zoologique du Québec *Canadian Nature Federation*
8191 avenue du Zoo *453 Sussex Drive*
Charlesbourg, Québec *Ottawa, Ontario*
G1G 4G4 Canada *K1N 6Z4, Canada*

INTRODUCTION

After a 13 year effort, 213 Canadian species have been placed on the COSEWIC (Committee on the Status of Endangered Wildlife in Canada) list. Although 20-30 reports may be reviewed each year, the rate at which species are added to the list in Canada does not reflect the rate at which they become endangered. On the other hand, the Recovery of Nationally Endangered Wildlife (RENEW) program has been established in 1988 to develop a national strategy for the recovery of endangered species. So far, 23 recovery

teams have been assembled for the 37 eligible species and only 3 recovery plans have been approved. This should be measured against a background estimate of 8,643 Canadian terrestrial, freshwater and marine species of plants, animals and microorganisms that are endangered or already lost (Mosquin & McAllister 1991). The purpose of this paper is to present a critical evaluation of these programs and suggest new ways to tackle the challenge of biodiversity conservation in Canada.

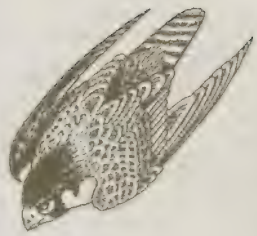
COSEWIC, 13 YEARS OF LISTING ENDANGERED SPECIES

COSEWIC is responsible for preparing an official national endangered species list, which is viewed with a great deal of respect and credibility. It is important that this credibility be maintained and that both the public and governments understand (and consequently support) listing of species by COSEWIC. As long as this is the case, species on the COSEWIC list enjoy special consideration, even though they may have absolutely no legal protection.

It is important that COSEWIC not fulfil a mere cataloguing function, as appears to be the case when the committee listed as extirpated the Illinois Tick-Trefoil (*Desmodium illinoensis*), a plant which is known from Canada from a single specimen collected more than 100 years ago. Rather, COSEWIC's activities should advance action on endangered species. Consequently, priority of status designation should be given to those species for which something can and should be done before their situation deteriorates further. We could, for example, concentrate our efforts on keystone and critical-link species, those often anonymous species that are considered to play a vital role in ecosystem function (Westman, 1985, *in* Westman, 1990). Invertebrate and plant species should be given more attention in this respect. Concerns about priority of listing have been expressed by some COSEWIC sub-committee chairmen, particularly by Dr.Erich Haber who is looking at some 500 plant species that are candidates for review. Such situations indicate that it is perhaps time to start using a habitat approach, i.e., designate habitats (rather than, or in addition to, species) so that, if protected or rehabilitated, the future of all species in those habitats is safeguarded. In this respect, the ecosystem approach to wildlife conservation suggested by the Ontario Wildlife Working Group (1991) must be commended. Identification and preservation of critical habitats (old-growth forests, marshes as well as wintering, nesting or calving grounds) or biodiversity hotspots is another approach that should be considered at the national level. Alfonso (1991) describes how geographic information systems (GIS) can be used to select areas rich in species or endemics for protection. Anderson (1984a, 1984b) demonstrated that hotspots for major groups of organisms do not differ substantially. The recent establishment of Conservation Data Centres by the Nature Conservancy and the GIS data base of rare Canadian plants currently being compiled by Dr. Haber should definitely contribute to identifying these critical sites.

The approach of the Quebec Endangered Species Act to that problem is worth mentioning. The Act provides for the establishment of a list of species susceptible of being designated as vulnerable or threatened and for which protective measures may be taken to ensure their survival (even prior to their inclusion on the official list).

As COSEWIC does its work it continues to run into "new" situations, which must be dealt with in a logical, consistent manner. Currently, there are problems with listing populations, with listing species that reach the northern limit of their distribution in southern Canada, and with the creeping in of political considerations.



a) Listing of populations

The Plains Grizzly (*Ursus arctos horribilis*) is a case in point. In April 1991, it was listed as extirpated. One must question the point of listing this animal at all, as no one is really sure whether there ever was a Plains Grizzly from the taxonomic point of view. Thus, we must assume we are dealing with part of the geographical range of the species. In that case, listing the Plains Grizzly goes against COSEWIC's own definition of an extirpated species: Any indigenous species of fauna or flora no longer known to exist in the wild *in* Canada but occurring elsewhere.

There are other considerations. Does it make sense to list a species as extirpated from part of its range? On the surface, this seems reasonable, even desirable, but problems arise if this is followed to its logical conclusion. Almost every Canadian species no longer occupies its entire original range. Should we then list species such as the wolf which no longer occurs over much of southern Canada? What about the Wolverine, Marten, Fisher, etc.? If we take this even further, we could end up in absurdities, such as listing very common species, for example, deer absent from cities. Also, almost every species now on the COSEWIC list would have to be revisited and listed as extirpated over parts of its range. In addition, how will COSEWIC deal with any of the currently listed populations if they should disappear?

Division of species into geographic populations (not necessarily coincident with taxonomic differences) certainly serves to draw attention to the plight of species in trouble in certain areas and encourages maintenance of populations over their entire recent ranges, which is very important. Moreover, it is very valuable for management purposes. At the same time, it gives rise to the problems discussed above. In addition, it confuses the public. Further it can be responsible for the addition of a large number of entries to the endangered species list, giving the impression that COSEWIC is being alarmist.

There does not seem to be an easy solution to this dilemma. It may be advisable to avoid, as much as possible, listing populations as separate entries and restrict listing to taxonomic groups only, down to the sub-specific level. In that case, it would be necessary to find other means of drawing attention to the plight of populations. Perhaps a separate list would be useful. The danger with that is that this second list might not be taken as seriously as the "main" list, or might be largely ignored.

b) Northern Distribution Limits

There are a number of species with most of their distribution range occurring in the US and barely reaching into southern Canada. Many of these get listed as vulnerable, as their populations in Canada are so small that they can easily disappear. Some get listed in

more serious categories. Yet, some of these species occur over a wide range in the US, and some are common there. Moreover, population fluctuations at range limits are a normal occurrence. By placing such species on the list, COSEWIC gives them the same importance as it does to species that are truly in trouble over most or all of their range.

For example, in April 1991, the Illinois Tick-Trefoil was added to the list as extirpated. Yet, it is known to have occurred in Canada from only one collection made in 1888 in southern Ontario, and has never been seen since. In this case, the species has a fairly large distribution in the US, but has never been abundant there. Nevertheless, it does not deserve the same importance as the Black-footed Ferret (*Mustela nigripes*) or Swift Fox (*Vulpes velox*). The case of the Illinois Tick-Trefoil is probably the most extreme in that it is probably a case of sporadic range extension. However, a number of other species are listed because their ranges extend only into small portions of Canada. It might be more practical, and certainly more sensible, to look at the health of species on an ecosystem basis, rather than taking political boundaries into consideration.

COSEWIC is in a bit of a bind on this one, however, as its mandate is to deal with the status of species *in Canada*, irrespective of their status in the US. However, there is no doubt that other species are much more deserving of attention. Also, there is a danger that COSEWIC may be taken less seriously if it lists species at the northern limit of their ranges in the same categories as species that are truly in trouble in Canada. Nevertheless it is the responsibility of each nation to preserve its biota, whatever their condition elsewhere. In some cases, it is the U.S. population which is of greater concern. We could 1) rate species differently or 2) fund preferentially those species in the greatest overall danger.

c) Political Considerations

A feature of COSEWIC is that range jurisdictions for any given species have a special say. This can be both positive and negative. Range jurisdictions often have a better understanding of what is happening and why, so their judgement on a matter can be very valuable. However, politics tend to creep in.

For example, the Polar Bear (*Ursus maritimus*) had been up for consideration for several consecutive years. Every time, COSEWIC believed that it should be listed but the range jurisdiction successfully argued for deferral. In 1991, even the range jurisdiction agreed that from the purely biological point of view, the Polar Bear should be listed, but still argued against listing for political reasons.

Another example of political intervention was the Sharp-tailed Sparrow (*Ammodramus caudacutus*) which was deferred only because the range jurisdiction, Quebec in this case, asked that it not be considered because no Quebec representative would attend the COSEWIC meeting as a result of the failure of the Meech Lake constitutional accord.

If COSEWIC is to do a proper job, hard scientific facts must be the sole basis upon which status is allocated. Theoretically, and to a large extent practically, this is the case now. However, it is not always the case. Consequently, a way must be found to eliminate political intervention. In this respect, we should pay attention to the suggestions made by Mace and Lande (1991) concerning the status attribution process.

RENEW, ACTING TO PRESERVE BIODIVERSITY

Being on the COSEWIC list does not offer a species any formal protection or confer any legal status. A few provinces have endangered species acts, but there is no consistency, and most provinces still do not have any endangered species legislation at all. However, because COSEWIC is respected and has credibility, species on the list often receive special consideration from governments, conservation organizations, and even from industry in some cases. As a result, environmental impact assessments take endangered species into consideration and recommend mitigation measures to maintain populations. Most efforts, however, are not as well organized and coordinated, and thus are not always as effective as they could be.

In 1988, the establishment of RENEW - Recovery of Nationally Endangered Wildlife- was seen as a good way to have all agencies, organizations and individuals work together to help species at risk.

Unfortunately, RENEW does not deal with plants, invertebrates, fish or marine mammals. It deals only with terrestrial vertebrates (birds, mammals, amphibians and reptiles) that have been listed by COSEWIC as threatened, endangered or extirpated. This means that even within these taxonomic groups, RENEW does not deal with species in the vulnerable category. So, whereas COSEWIC is restrictive, RENEW is even more so; it is committed to addressing only 37 of the 213 listed species (17%). Canada's marine fauna is given low priority even though we have the longest coastline of any nation, and possess 6.5 million km^2 within our 200 mile fishing zone and our Arctic Sector (vs 10 million km^2 of terrestrial habitat).

Although the creation of RENEW is a positive step, progress has been very slow. In 1989, RENEW made the commitment to have, by 1991, recovery teams in place for all 26 species eligible at that time. Recovery plans for 12 species were to be approved by the fall of 1990, for 12 more species by a year later, and the remaining species by the fall of 1992. However we are still struggling with the creation of recovery teams and preparation and approval of recovery plans. By February 1992, the number of eligible species had increased to 37. Recovery teams have been assembled for 23 of these. To that date, only three plans had been approved -- for Whooping Crane (*Grus americana*), Peregrine Falcon (*Falco peregrinus anatum*) and Piping Plover (*Charadrius melodus*). Another seven plans have been submitted but are not yet approved, and twelve other draft plans are in preparation. Obviously, the process is painfully slow. A great deal of time and money are required for this species-by-species approach. The implementation of the habitat approach would be much more effective, especially for species groupings requiring similar conditions. Such areas for plants could be easily located using Dr. Haber's GIS system.

One way to speed up this process is through greater interagency cooperation and development of new partnerships. For example, RENEW should establish closer working relationships with Forestry Canada, Fisheries and Oceans Canada, the Canadian Council on Ecological Areas and the Canadian Museum of Nature (the latter has one of the nation's largest biodiversity data bases, BIODIV). The establishment of conservation networks has recently been suggested in order to protect and manage the large natural areas needed to sustain key species as well as the integrity of entire ecosystems (Salwasser et al. 1987). Recovery teams should identify and integrate in their recovery plans NGOs and institutions such as zoos, aquariums, botanical gardens, conservation organizations, science museums, interpretation centers, colleges and universities, that could help them fulfil their mandate at the local level. Government authorities that oversee conservation efforts should formally recognize the financial, scientific and/or technical contributions of private corporations, NGOs and private or public institutions to recovery plans by signing memoranda of agreement. These memoranda of agreement would not only help to ensure long-lasting cooperation between organizations (Salwasser et al. 1987) but could foster the contribution of other, previously unknown partners to the immense task of preserving biodiversity (Prescott & Hutchins, 1991).

Provincial and territorial jurisdictions are key players in the protection of biodiversity. Through the recent endorsement of "A Wildlife Policy for Canada" they have recognized the maintenance and reestablishment of biodiversity as one of their major goals. They must now increase their contribution to RENEW and ensure that sufficient funding is available. In addition, ways must be found to deal with the 83% of COSEWIC species not currently eligible under the RENEW program, and those yet to be listed by COSEWIC.

OTHER INITIATIVES

Although COSEWIC and RENEW are important when dealing with endangered species, they are, by no means, the sole players. Over the years, much has been done without these two committees. Whooping Cranes would probably be extinct by now if it hadn't been for the work done by interested people and governments before either COSEWIC or RENEW ever existed. Vancouver Island Marmots (*Marmota vancouverensis*) have also received help prior to the existence of RENEW. Captive breeding and subsequent reintroduction efforts have been initiated by dedicated people for the Swift Fox. But perhaps the biggest success story is that of the American White Pelican *(Pelecanus erythrorhynchos)*. This species was listed in 1978 by COSEWIC as threatened. Even though no RENEW recovery plan was ever written for the species, Canada Life (whose corporate logo is the American White Pelican) and World Wildlife Fund-Canada combined forces and did some tremendous work. As a result, the pelican was removed from the list in 1987, the only species to have ever been delisted.

One might ask: Is any attention being paid to non-RENEW species? And what about non-COSEWIC species - the lowly invertebrates and non-vascular plants? Fortunately there are people interested in all these taxonomic groups.

The St. Lawrence Beluga (*Delphinapterus leucas*) in Quebec, the Right Whale (*Balaena glacialis*) off the east coast, and the Sea Otter (*Enhydra lutris*) in BC, all of which are marine mammals, have their champions. Along the west coast, sea otters were once numerous but the last individual was shot in 1929. Between 1969 and 1972 (again, before both COSEWIC and RENEW), scientists from the Pacific Biological Station released 89 otters from Alaska in an area off the west coast of Vancouver Island. Now there are over 300 sea otters in British Columbia's waters. A group of Quebec scientists and citizens are studying problems faced by belugas in the extremely polluted St. Lawrence River. Aided by Quebec conservation groups, the St. Lawrence National Institute of Ecotoxicology, WWF-Canada and the Canadian Nature Federation (CNF), they are seeking to establish a marine park to protect their habitat. Without waiting for RENEW to extend its mandate to include fish and marine mammals, the Department of Fisheries and Oceans, as the agency responsible for these species, has begun to work on their recovery. As the recovery plan format is working quite well, DFO is basing its efforts on the RENEW pattern.

The invertebrates are generally a lot less fortunate. They are not valuable as game species, and most are not well loved by the general public. However, even here, some taxonomic groups have found champions. Butterflies, perhaps because many are quite showy, have been the centre of considerable attention. The Monarch Butterfly (*Danaus plexippus*), though in no danger in Canada, is vulnerable on its wintering grounds. Consequently, Canadians, including the CNF, have been working with Mexicans to ensure that important wintering habitat is preserved. A major travelling exhibit on this fascinating species is currently being produced by the Canadian Museum of Nature, the CNF and a Mexican conservation group called Monarca A.C. Another example closer to home is that of the Karner Blue (*Lycaeides melissa samuelis*). A CNF affiliate, the Lambton Field Naturalists, raised money to buy critical habitat in southern Ontario. Other examples of local groups, and even individuals, helping endangered species can be found. In many cases, these efforts are effective because the people involved are very close to their subjects, and know exactly what is required.

However, a chronic lack of funding for such projects can be crippling, or render efforts useless. In recognition of this fact, Environment Canada and WWF-Canada joined forces and contributed $1 million each to create the Endangered Species Recovery Fund. This fund, administered by WWF-Canada, is used to assist in practical, applied work towards the recovery of endangered plants and animals native to Canada. It is not limited to species covered by COSEWIC or RENEW. Priority of funding depends on the national significance of projects, based on the degree of threat, taxonomic uniqueness, geographic distribution and potential for recovery. Applicants for funds must normally be affiliated with a non-governmental organization, however, direct funding of individuals or companies may be considered in some cases. As of February 1992, ESRF has funded more than 76 projects across Canada. Although this program has been successful, there is a need to streamline the allocation of funds and develop a proactive manner to identify priority projects.

CONCLUSION

It is evident that a great deal is being done for endangered species, but this does not mean that we can relax. In fact, there is a lot of room for improvement, and many species still await attention. In Canada, while we are lucky enough not to be losing species at this time, we must remain vigilant and ensure that the less popular groups are also looked after so that all Canadian wildlife -- all wild species -- continue to exist. We must also work very hard to prevent species from becoming endangered. In other words, prevention is still far better than cure.

ACKNOWLEDGEMENTS

The first author wishes to acknowledge the financial contribution of the **Fondation pour la sauvegarde des espèces menacées** to the preparation of this manuscript. Dr. Don E. McAllister provided useful comments to the authors.

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NGO CORNER

Blue Planet: Now or never statement

We are destroying the life support systems of this planet and threatening not only civilization as we know it but also the survival of our species. This conclusion follows from information freely available to most of us. At the same time there is a unique opportunity to choose how we shall relate to the global ecosystem and reverse trends that now threaten us with widespread catastrophes in the coming decades. No conventional scientific or economic approaches will reverse these trends without regard for long-term consequences.

Population: Currently there is a net gain in population of more than 90 million each year. This level of fertility will produce a global population of 9 to 15 billion within the next century if death rates are not to rise. Such a mass of human beings is not conceivably sustainable. Checks to its growth are therefore a certainty. These will occur either through vigorous efforts to reduce fertility, or through catastrophic death induced by ecological degradation and acts of human desperation or perhaps both.

Fossil fuels: Cumulative use of fossil fuels has doubled every 20 years since 1890. If it doubles again in the next 20 we shall have used up between a quarter and a third of the world's total endowment and over half the conventional petroleum. Burning fossil fuels of all kinds creates the probability of serious climate change and produces poisons whose effects on the air, waters, lands, and all life on this planet are increasing, and threaten major crises in many regions.

Disparity: The current level of global population and energy use demands consideration of the harsh reality of huge North-South disparity. The billion people in the North use 10 times the resources and produce 10 times the waste per capita, compared to the 4 billion in the South. Thus the entire world is, in effect, over-populated, and most people live below the poverty line.

Resultant: Most environmental, economic and social problems of local, regional, and global scale arise from this driving force: too many people using too many resources at too fast a rate. The problems are often perceived to be discrete and hence addressed piecemeal. Remedial efforts are concerned with symptoms rather than the driving force.

Action: What must be done? The accelerations are now at impossible levels. All environmental and most economic and political problems on Earth are associated ultimately with these forces. They must be slowed, stopped and reversed. We live on a finite planet and are part of nature. Human activities are the most dynamic and threatening force in the biosphere.

Challenge: This is not an uncongenial challenge. Quickly and voluntarily embraced it could bring benefits to all humankind. Let us recognize that we cannot go on as before, and embark immediately and deliberately upon a bold course of global ecological sustainability.

We must therefore seize the brief opportunity to change the course of events and encourage each other to take action that will lead to a viable global future for humanity. What is needed **now or never** is an unparalleled revolution in our way of thinking about our future.

THE BLUE PLANET GROUP

This paper was prepared by a group of concerned citizens, who give their opinion without affiliation to any institution or agency, and with no particular philosophy or sociological position. They cover a wide range of disciplines and knowledge, and are convinced of the need to take some action at this moment in human development.

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Diverse quotes

"We are now faced with the fact that tomorrow is today. There is such a thing as being too late. Over the bleached bones of numerous civilizations are written the pathetic words: 'Too late.' If we do not act, we shall surely be dragged down the dark corridors of time reserved for those who posses power without compassion, might without morality and strength without sight."

Martin Luther King

"But now we have a chance to change that. For the first time we have a scientific basis for a new ethic. In 1992 we will have the most important meeting in the two-million-year history of our species," when more than 70 percent of the world's heads of state will convene in Rio de Janeiro for the Earth Summit.

José Antonio Lutzenberger
Ex-Secretary of the Environment
Audubon, November-December 1991, p. 97

"It's so incredibly impressive when you look back at our planet from out there in space and you realize so forcibly that it's a closed system - that we don't have any unlimited resources, that there's only so much air and so much water.
You get out there in space and say to yourself: That's home. That's the only home we have, and the only one we're going to have for a long time".

Edgar Dean Mitchel, Apollo 14 astronaut

In the end we conserve only what we love; we love only what we understand; and we will understand only what we are taught.

Baba Dioum of Senegal

We can leave resources and
space for other species by population restraint.

Planet of the Killer Apes

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Human ancestry has been traced to ape-men and ape-women, now extinct, who inhabited the plains of Africa more than a million years ago. They had become formidable hunters, with a unique ability to make and use weapons, and a unique knack of communication. They have been called, aptly, Killer Apes.

Perversely, we cherish a myth that subsistence hunting societies lived "in harmony with Nature". It is true that of the many recently extinct animals to which we can attribute some gastronomic significance, there are few of whose fates we can be certain. Sometimes their extinction can be tied to the advent of humans, as is the case with the giant moas of New Zealand. In other cases, such as those of the great auk and Steller's sea-cow of the Northern Hemisphere, the evidence is that their "last stands" were only on the remote, off-shore islands that their subsistence persecutors were unable to reach.

True, some human societies have appeared to live in harmony with their prey. One such case may be that of Inuit communities and ringed seal populations cohabiting the fast ice of the Central Canadian Arctic. The situation there seems to have been one of complete dependence: when seals became scarce, the people had no alternative sustenance, and died, thus reducing predation rates on the seals. But where there is a variety of prey species, such relationships seem unlikely to develop. Once specified as a primary prey species by the formidable Killer Apes, and their descendants, we can readily imagine that extinction was always a likely outcome.

We like to think that our hunting progenitors have largely disappeared, transforming themselves into the nurturing shepherd and the innocent farmer. But the rate of species extinction is accelerating: are we, then, cherishing another myth? Is Earth indeed still Planet of the Killer Apes?

Human numbers are growing very rapidly, by ninety million or more a year. It is generally agreed that the rate has been accelerating for several thousand years. Earth supported a billion of us at the middle of the 19th Century: we will be over six billion when we enter the 21st.

What has the number of humans on Earth got to do with the extinction of other species? To answer that, we must examine how we live, and how it is that we have prospered and become so numerous.

Like other living things, we survive by channelling the productive energy of the environment into and through our tissues. It enters the biosphere in the form of radiant energy from the sun, and is picked up and used by green plants to build and power their own cells and tissues. From them, it passes into herbivores, which are eaten by carnivores, which are used in turn by scavengers and decomposers. One way we channel it to ourselves is to interrupt this "food chain" at a link which allows for convenient

harvesting. Depending on how completely we harvest this link, there may be serious consequences to other species, too: those above it in the food chain, with their reduced support.

Harvesting living resources, for example by fishing, is one way in which we affect the survival of species, but we also channel productivity in much more destructive ways. Heavy grazing is one: it progressively eliminates first the most preferred plant species and then others, with, of course, the plant and animal species that depend on them. The most drastic is agriculture. Clearing forested land destroys a complex ecosystem, made up of an interacting web of fungi, plants, bacteria, single-celled animals, insects, spiders, mites, amphibians, reptiles, birds and mammals. The cleared land may then be seeded to a single species of grain; efforts by other species (rusts, "weeds", "insect pests", etc.) to colonize the crop are rebuffed; and , after the harvest, the land is returned to a cleared condition, ready for reseeding.

The more energy we channel into ourselves, the less there is, obviously, for the food chains from which it was diverted: the less there is to nourish the tissues of other life forms. The more of the ecosystem we and our activities occupy, the less remains for other species. We see some of the extinction-causing activities of people - clearing tropical forests, for example - as reprehensible; but others, such as the "Green Revolution", are seen as laudable. The Killer Apes have changed their ways, but not their selfish ends.

Is a drastic reduction of biodiversity inevitable? Yes, if we keep channelling more and more of Earth's productive energy into humanity. How can we seek to protect the remaining biodiversity of the world? Allowing a small proportion of Earth's surface to remain undisturbed will not be enough. Instead, we must decide how much of her productive energy we can allocate to our direct use, recognizing our dependence on the services - atmospheric, hydrospheric, geospheric, biospheric - which she provides. This means halting the growth of human population, stabilizing and probably reducing it. Apes we will always remain, and still selfish; but perhaps no longer Killer Apes, but Wise Apes, knowing to live gently on Earth, for the longer term.

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NEWS

Biodiversity News Notes

Flora of the Philippines Project

The *Flora of the Philippines Project*, a joint effort of the Bishop Museum and the Philippine National Museum, began operations this in 1991. The results of this project will provide a detailed and up-to-date "map" of plant species throughout the Philippines. Like many tropical regions throughout the world, the Philippines has experienced tremendous ecological pressure from expanding human populations and economic exploitation of natural resources. The Flora Project will be instrumental in showing how these pressures have changed the landscape and how seriously the diversity of the local flora has been reduced. This information will be used by natural resource managers to develop conservation solutions. [**Bishop Museum Annual Report 1990-1991**. p. 14].

US National Science Foundation budget increases

The 1992 fiscal year budget for the U.S. National Science Foundation has been signed by the President. The overall increase is 11.3%; if the Department of Defense is given funds by Congress to pay for $105 million in costs for the Antarctic Program, the overall increase will be 15.8%. The NSF has also been reorganized. Environmental biology (DEB) which includes ecology, ecosystems, populations biology and systematics programs, and Biological Research Resources, will have a new name: Research Collections in Systematics and Ecology. [**The ASC Washington Initiative** 5(10): 2].

Frogs hold key to curing infections?

Frogs may hold the key to curing a wide variety of infections, according to two Australian scientists. A U.S. firm has signed an agreement with them to develop the amphibian's unique antibiotic properties. Peptides found in frog skin gland secretions exhibit antibiotic properties, including activity against golden staphylococcus, a bacteria notoriously resistant to antibiotics. Another peptide showed promise in treatment against sexually-transmitted diseases. [**Ottawa Citizen**, Our Planet, p. E2, 23 February 1992].

St. Lawrence River Action Plan

An agreement between the Nature Conservancy and the Canadian Wildlife Service has been signed, and funds secured for acquisition of shoreline and islands along the St. Lawrence River by March 31st, 1992. Land ownership and other site-specific data has been compiled for 32 islands, and negotiations initiated with 5 landowners. [**Nature Conservancy of Canada, *Inside the Ark*,** December 1991].

Prairie land protected

A formal dedication ceremony for transfer of 5500 acres of mineral lease holdings to the Canadian Parks Service was scheduled for January 13th, in Regina. The federal Minister of the Environment has agreed to attend. Transfer of the leases will remove one of the major impediments to designation of the largest grassland park in the world.

The 80-acre Rose (Tesluk) Property, an area of quality tall grass prairie, has been acquired by the Nature Conservancy in cooperation with the Manitoba Naturalists Society. Title for three properties, totalling 400 acres, will be transferred to the Manitoba Naturalists Society. [**Nature Conservancy of Canada, *Inside the Ark*,** December 1991].

Freshwater diversity needs exploration

The diversity of freshwater life is poorly known and attracts little public attention, according to J. David Allan, a freshwater ecologist at the University of Michigan in Ann Arbor. The freshwater fish and invertebrate diversity of tropical forests and streams have attracted less attention that the surrounding forests. Yet freshwater tropical fish represent the one last great void in the knowledge of global vertebrate diversity. About 100 new fish species are described annually, most from the tropics, while at most two new bird species are described annually, world-wide. Complete studies of invertebrates are even fewer. However a detailed study of a metre-wide stream in Germany revealed 1,044 species of invertebrates. Most diversity was shown by the least-known groups, the round

worms, rotifers, segmented worms and flatworms. Unlike most other groups, freshwater invertebrates seem to be richer in temperate than in tropical regions. Scientists are unable to explain this phenomenon. The imperilment of freshwater biota is high, according to Dr. Allan, and protection lags behind. [**Bioscience** 41(11): 756-757, 1991].

Conservation definition

Conservation is an old yet still much-debated concept. When Dr. Colin W. Clark of the University of British Columbia was recently asked to define conservation at Smithsonian-sponsored National Forum on Ocean Conservation, he said, "Conservation is survival." [**Today's Aquarist** 4:(10): 8, 1991].

Loggers and environmentalist sign joint forest accord

On the west coast of North America loggers and environmentalists have been at odds. Loggers' jobs are at risk as the environmentalists try to protect the last remaining old growth forests and forest regeneration has not kept up to the demand for trees. However, 12 hours of negotiation, with the help of a mediator, has led to a historic accord between the International Woodworkers of America (IWA) and southern Vancouver Island, British Columbia environmentalists. The accord was signed on the steps of the provincial legislature on behalf of the IWA Duncan Local1-80 and by Clinton Webb of the Western Canada Wilderness Committee on behalf of a caucus of environmental groups.

The accord states: "A crisis in our forests is causing intense and unacceptable land use conflicts. Decades of government and industry mismanagement, overcutting and environmental degradation have seriously depleted both employment opportunities and the original old growth forests." The accord then declares "the common ground and unity of purposes" between workers and environmentalists to demand changes in forest management and stewardship. The accord signifies agreement that some old growth forest ecosystems must be protected in perpetuity, calls for job creation strategies including value-added manufacturing, and for environmentally appropriate logging systems. The accord also calls fro fair and expeditious resolution of native land claims. A key clause states, "Some logging practices must be changed to protect all forest functions including in particular: wildlife and fisheries habitat; river systems; biodiversity and soil productivity. Such changes must ensure a safe working environment." [**The Watershed Sentinel**, Cortes Island's Environmental News Magazine, October/November 1991, 1 (5): 6].

Human gene inspires new prostate shrinking drug

Many older men develop enlarged prostate glands, constricting the flow of urine and causing other problems. Merck and Company has developed a new drug, Proscar, that shrinks prostates and may be an answer to this ailments. The drug is based on the finding that there was a genetic basis to the delayed development of male characteristics in the children of a remote Caribbean mountain village. The genetic trait caused a deficiency of an enzyme called 5-alpha reductase, causing depressed levels of the male hormone dihydrotestosterone. The new drug, if it wins final approval for use, may be a new billion-dollar earner for Merck. [**New York Times**, 16 February 1992].

Illustration of the Barred Bandicoot, *Parameles bougainville*.
This small (less than 30 cm in length) marsupial is a member of the family Paramelidae. This species is solitary and crepuscular (active only at dusk and dawn). Barred bandicoots feed on small invertebrates such as spiders, earthworms, insect larvae, as well as berries, seeds and fleshy roots. Early accounts suggested that this animal was common in many localities across much of Australia. It is now found only on two islands in Shark Bay, Western Australia. Reasons for its demise are thought to be habitat alteration by cattle and rabbits, as well as predation by introduced dogs and cats.

Asthma gene identified by British team

A team of British doctors have identified the gene that causes asthma. The discovery by doctors at Oxford's John Radcliffe and Churchill hospitals will permit developing drugs inhibit the allergy-causing proteins released by the asthma-causing gene. [**Ottawa Citizen**, 9 March 1992].

Synthesis of the taxol molecule

Paul Wender, chemist at Stanford University, has overcome the difficulties in synthesizing taxol [**Ottawa Citizen**, 29 March 1992, p. E1]. Taxol, a compound, obtained from the bark of the western yew, has shown great promise in combatting breast, ovary and lung cancer, but its supply is limited because yew seedlings have not been replanted in logged over areas. Wender's research group has found a short way of manufacturing taxol from an inexpensive substance. This method may permit large-scale production at reasonable prices and permit wider use for researchers and patients. The taxol supply is restricted to a diminishing supply of the trees and their bark found in old growth forests.

Gray Whales increase

In 1937 it was estimated that there were less than 2,000 gray whales left in the world. Weighing in at about 35 tons, the 50-foot-long grays are now estimated to number 19,000.[**Victoria Times Colonist**, January, 1992].

Guyana rainforest to be logged

A Malaysian company, active in clearcutting forests in Sarawak and accused of many human-rights abuses, has been granted a 17,000 square kilometre logging concession in Guyana's rainforest. Barama Ltd. signed a 25-year lease with Guyana, as part of an effort, sponsored by the International Monetary Fund, designed to rescue the country from its $1.7 billion of debt. The concession is believed to be the home of groups of Warrau, Lokono, Karinya and Akawaio Indians. Barama will develop timber processing and plywood plants, and ship the products to customers. Exports of minerals, cash crops as well as lumber, are being sought under the export drive. [**BBC Wildlife**, January 1992, p. 56].

Ethnobiology meetings

The Society of Ethnobiology held its 15th annual conference March 25-27, 1992 at the National Museum of Natural History, Washington, D.C. Over 75 papers were presented. Included were a paper by Bradley C. Bennet, **Plants and people of Ecuador's Amazonian rainforests: Lessons and needs for sustainable development**. Bennet reported that the Shuar people use 196 species for food and 245 species for medicines. Collectively Amazonian Ecuador's native peoples use nearly half of the region's 3,500 species. Edelmira Linares and Robert Bye gave a paper, **Medicinal plants in Mexico: An evaluation of a botanical-cultural resource**. According to their Mexican medicinal flora registry there are 3,352 species and this represents about 15.5% of the national vascular flora. However about one third of Mexico has yet to be investigated for medicinal plants; the northern arid region is the least known area.

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Biodiversity Meetings

■ **13-17 July 1992.** USDA Forest Service: Biodiversity in Managed Landscapes - Theory and Practice. Contact:

Robert Szaro
Forest Environment Research
USDA Forest Service
P.O. Box 96090
Washington, D.C. USA

■ 2-7 August 1992. International Symposium on the Status and Future of Large Marine Ecosystems of the Indian Ocean, Mombassa, Kenya. Contact:Dr. Okemwa
Tel: (254) 11-472-215.

■ **17-21 October 1992.** Eco Ed'92: Education and Communication World Congress on Environment and Development.
Toronto (Ontario), Canada
Contact:

Mr. Chuck Hopkins
Tel: (416) 483-9212
Fax: (416) 482-9601

■ **9-13 November 1992.** Indonesian Environmental Management and Information Center: Pacific Organization Conference on the Environment 1992 (POCE '92). Contact:

Indonesian Environmental Management and Information Center
Jalan Kramat IV Nr. 8
Jakarta Pusat 10420, Indonesia
Tel: (6221) 35-74-49
Fax: (6221) 310-1656.

Book and Periodical Niche

Caring for the Earth
A Strategy for sustainable living. Published by The World Conservation Union (IUCN), United Nations Environment Programme (UNEP), World Wide Fund for Nature (WWF), 1991, Gland, Switzerland, paperback, 228 pp. Order from: **The Canadian Committee for IUCN**, Canadian Museum of Nature, P.O. Box 3443 Station "D", Ottawa, Ontario, K1P 6P4, Canada. Cost: $16.05 (includes GST).

The title describes the focus throughout the book. How can we confidently nurture and protect this global garden and keep it healthy and thriving, while living within it? The answer is by sustainable living.

Caring for the Earth is an international publication that addresses worldwide strategies for sustainable living and outlines specific needs for the integration of conservation and development. It provides a complete outline of present and potential environmental concerns. As well as proposing guidelines, goals, and actions to minimize the threat to the environment, it still takes into consideration the development of civilization. Its tone regarding environmental concerns is one of improvement of the standard of living for all people by maintaining biodiversity and preserving the environment from human impacts.

Discussion of environmental and developmental issues demonstrate that humankind can benefit by finding a necessary cooperation between the natural world and the human world. **Caring for the Earth** can be used by governments, industries, consulting companies, community developers and planners, educators, and concerned individuals for making policies, planning, prioritizing, and getting ideas.

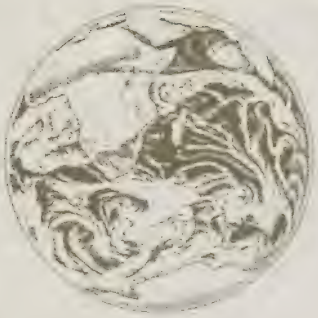
Caring for the Earth is divided into three parts: Principles for Sustainable Living, Additional Actions for Sustainable Living, and Implementation and Follow-up. Part I, Principles for Sustainable Living, outlines necessary plans, goals, and actions that all work towards developing sustainable societies. It presents suggestions to improve global society through cooperation and development. It discusses building a sustainable society, respecting and caring for the community of life, improving the quality of human life, changing personal attitudes and practices, and creating a global alliance. Plans for maintaining the Earth's nature are outlined. Subjects covered are conserving the Earth's vitality and diversity and keeping within the Earth's carrying capacity. To maintain or improve our standard of living internationally, developmental and environmental issues are considered side by side. Subjects such as enabling communities to care for their own environments, providing a national framework for integrating development and conservation are discussed.

One of the many ideas the publication presents is that a possible method of improving the quality of human life worldwide is to use a portion of the military budgets of developed countries to invest in sustainable development in lesser developed countries. Other specific actions are suggested to conserve the Earth's vitality and diversity and to benefit humankind. For example, natural predators of pests could be used in agriculture instead of chemical pesticides which are general biocides. In order to maintain the Earth's biodiversity, human carrying capacity must not be exceeded. Among the concerns listed to keep within this population limit are a decrease in the global birth rate and a decline in resource and energy usage.

Part II, Additional Actions for Sustainable Living, details specific actions for different areas of development and the environment such as energy, business, industry, and commerce, human settlements, farms and range lands, forest lands, fresh waters, and oceans and coastal areas. For example, the business world should incorporate concern for the environment into their practices, from paperwork to products. Efficient, convenient public transport systems should be planned, constructed, and used by the majority of people in urban centres. To increase local biodiversity and decrease the stress on the land, multi-crop agriculture should be considered. Reforestation should be a major focus in the management of the world's forests. Because small-scale community fishing efforts consume 10% of the energy consumed by large-scale commercial fisheries, smaller-scale local community fishing should be promoted.

Part III, Implementation and Follow-up, gives the reader a tool, knowledge of the system, to be able to carry out the goals of the reader through action. Eight annexes at the end of the book provide backup information summarizing world population statistics, net primary production destruction, indicators of sustainability, and an estimation of the cost to implement the suggestions in the publication.

The deadlines and goals of the actions outlined in **Caring for the Earth** are very demanding, yet realistic and necessary for this global mess that civilization is creating. The document uses the facts of the enormous environmental and developmental crisis to get the point across without using emotional manipulation. The text is presented in a factual, logical, and objective manner which provokes the readers into productive thought if not guide them to action. This difficult topic is extremely broad and



spans many domains, is changing and expanding every day, and is very political. The IUCN, UNEP, and WWF have done an exceptional job in creating an objective comprehensive realistic outline of plans of action. Let us follow their example in creating this top-class document by putting their written words into a first-rate reality with our collective response, by **ACTING**!

Rhiannon Johnson
Canadian Centre for Biodiversity
Canadian Museum of Nature

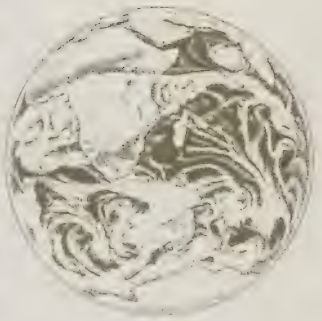
Making a World of Difference
A directory of women in Canada specializing in global issues. By The Canadian Council for International Co-operation. University of Toronto Press, 5201 Dufferin Street, Downsview, Ontario, M3H 5T8, Canada. 314 pp. Softcover. ISBN 0-919072-96-8. $15.00 + Postage and Handling + GST.

Making a World of Difference is a directory which profiles over 250 professional women in Canada working towards improving the global situation in fields such as the environment, development, peace, and social justice. The bilingual directory presents most of the individuals in the style of one-page CV's, consistent in format throughout the book. The women's skills, areas of specialization, languages, experience, education, memberships, highlights, quotes, and information on where they can be contacted are outlined. This professional publication also shows the personality of the women through quotes, pictures, and verbal styles of the profile presentations.

The directory is useful to non-governmental organizations, businesses, and governments as a resource of high-quality skilled people for involvement in public speaking, organizing and teaching workshops, writing, editing, researching, graphic designing, coordinating, accessing resources, and making presentations. The directory differs from other related directories in its selection, detail of the individuals' careers, and portrayal of personalities. Instead of collecting and sorting through a pile of mediocre CV's speckled with a few exceptional ones, the directory provides a consistently formatted package of high-quality individuals for casual perusal.

As well as promoting professional women, which contributes to gender equality, the directory seems to project little favouritism of politics, formal education, skin colour, or preferred language. In the section **Some Women of Distinction**, Barbara McDougall, a Progressive Conservative, shares the same page as Audrey McLaughlin, the leader of the New Democratic Party. The limited selection of visible minorities, however, was a disappointing comment on either the publication's selection of women or, more likely, on Canada's societal mix of professional women. The directory could have been better organized by sorting individuals by area of specialization rather than sorting them by name.

As a woman at the beginning of her career, I found it inspiring, fascinating, and eye-opening to see the numerous exciting careers and extensive experience that Canada's women have in these areas. Because of its detail and clarity, the publication created a window through which I could trace the steps of each life, through each milestone. This directory provides a valuable bank of exceptional female role models involved in global issues. Perhaps this publication could be used in educating young women on their potential for success in these areas. The number and quality of professional women in Canada shown in **Making a World of Difference**, impressed me with the realization of the resource and army of globally-sensitive intelligent and active women we have in Canada.

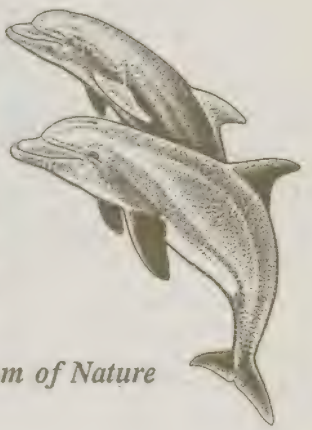


Rhiannon Johnson
Canadian Centre for Biodiversity
Canadian Museum of Nature

Fight for the forest
Chico Mendes, in his own words. Additional material by Tony Gross. 1989. Latin America Bureau (Research and Action) Ltd. 1 Amwell Street, London EC1R 1UL, U.K. 96 pp. Paperback. ISBN 0-906153-51-3. Can$8.95.

The saving of biodiversity is not always a simple conservation problem. It often has politics, money, threats, and sometimes death in it, ideals and courage. This book recounts the approaches and beliefs of Chico Mendes, a rubber tapper who tried to save the Amazon rainforests. He organized the rubber tappers and made representations to governments that the rainforests were worth saving for the value of rubber and Brazil nuts. He forged links between rubber tappers and aboriginals, previously opponents. The ranchers opposed his organization and finally one of them killed Chico. But they did not kill his ideas. The book is worth reading for his story and the messages. It is nicely illustrated.

Canadian sources of environmental information / Sources canadiennes d'information sur l'environnement
Environment Canada, Information Holdings Management Branch. Soft cover, 438 pp. Published by and available from: Canadian Government Publishing Centre, Supply and Services Canada, Ottawa, Ontario K1A 0S9, Canada. ISBN 0-660-56256-1.
This bilingual book provides an inventory of specialists active in various fields of the environmental sciences and related disciplines. At the same time it provides Canadian input to INFOTERRA, the international referral network of the United Nations Environment Programme. Amongst man subjects covered included in the useful English and French indices are: acid rain, air pollution, drinking water, ecological monitoring, environmental assessment, fisheries, forestry, resource management, water quality and wildlife. Specialists are arranged alphabetically by name and the entries include address, phone and fax numbers, Subjects they are expert in, Organizational Significance (national or international, local, regional or municipal), Functions (e.g. environmental monitoring, research, education), Geographical Coverage, Working Languages and Characteristics (e.g. publication of reports, processed data, expert assistance or advice). Twelve persons



are listed under Birds and Taxonomy (no animal taxonomists), 36 under fishes, and 13 under Wildlife. There is no subject entry for Biodiversity or Biogeography. There is an entry for identification of pollutants, but not for identification of biota. There are several hundred headings under which specialists are listed. The specialists listed are primarily from government departments, with some from industry, universities, consulting companies and NGOs. This publication provides a useful index to some of Canada's environmental expertise. Its strong point is that it pinpoints the individual expert in an organization.

Don E. McAllister
Canadian Centre for Biodiversity
Canadian Museum of Nature, Ottawa

The federal policy on wetland conservation
Environment Canada. 1991. Published by Minister of Supply and Services. 14 pp. ISBN 0-662-18940-X. Obtainable from: Director General, Canadian Wildlife Service, Environment Canada, Ottawa, Ontario K1A 0H3, Canada.

Discussions on decision making practices for sustainable development
By National Round Table on the Environment and the Economy, 1 Nicholas Street, Suite 520, Ottawa, Ontario K1N 7B7, Canada. 134 pp.
Contains useful discussions and the following checklists: Business aims and strategies; Management systems; Staff education and training; Workplace and office practices; Recognition and reward systems; Information sharing; Compliance with appropriate legislation; Product development and improvement; Purchasing practices; Production, manufacturing and service processes; Energy and water management; Marketing; Building design and construction; Technologies; Investment and lending decisions; Risk management (public liability); Cooperative business relationships; Community involvement and responsibility; Regional and global responsibilities; Emergency preparedness; Biological resource use; and Resource management. Samples of the many questions include: Do you attempt to rehabilitate resource wastes that emerge from your operations? Can temperatures be reduced in wet processes? Can the leakages and faults causing emission be reduced? Has a waste audit been carried out? The questions are to the point and make good environmental and business sense for a company that wants to compete and survive in the modern world. The Round Table publishes a companion volume, **Sustainable development: A manger's handbook.**

The Bottlenose Dolphin
By Stephen Leatherwood and Randall R. Reeves (editors). 1991. Academic Press, Inc. San Diego, California, 653 pp. ISBN 0-12-440280-1.

This book brings together a series of papers (chapters) on the history, biology, taxonomy, behaviour, distribution management and current research techniques of the most familiar of the dolphin species, the bottlenose dolphin (*Tursiops truncatus*). The intent of the editors was to publish a collection of papers, presenting a state-of-the-art summary by experts in cetacean biology to represent "...good work that seemed to be taking too long to reach print."

The text is comprised of 36 papers divided into six major subtopics covering all aspects of the biology and diversity of this beautiful animal. Each paper is well documented with maps, figures, graphs and photographic illustration so that the reader may in effect create a better overall knowledge and compare results from paper to paper with little confusion.

Bottlenose dolphins occur in virtually all tropical and temperate marine waters and regional coverage of the species within the chapters of this book is generally good, although some areas are not treated (e.g., coastal southern Africa) and others receive only little attention.

Having had a recent and very enjoyable close encounter with the bottlenose dolphins at Shark Bay, Western Australia, I turned to Chapter 5 in the book, written by Ross & Cockcroft, on the taxonomic status of the Australian bottlenose forms. I was surprised to learn that even though the bottlenose (first described in 1821) has been intensively studied both in the wild and in captivity and is doubtless the best known of the delphinids, the status of the nominal species is poorly understood. Ross and Cockcroft conclude that evidence is sufficient to consider the Indian Ocean and adjacent Western Pacific Ocean forms of the species, characterized by adults with a spotted ventral surface, as a distinct subspecies (*Tursiops truncatus aduncus*).

Although I did not read in great depth all of the included chapters, those I did read or scan were found to be well written, again well illustrated and generally free of typographical or other editorial errors.

The book will provide the marine biologist with a wealth of information, brought together in one publication representing our current knowledge of this intriguing and important marine mammal.

David M. Jarzen
Canadian Museum of Nature, Ottawa

Ozone diplomacy
Richard Elliot Benedick. 1991. Harvard University Press, Cambridge, Massachusetts and London, England. 300 pp. Paperback. ISBN 0-674-65001-8.
Combines science, politics and diplomacy in a fascinating account of the origins and realizations of the precedent-setting Montreal Protocol on Substances that Deplete the Ozone Layer, adopted in 1987 and revised in 1990.

Fishes of the Great Barrier Reef and Coral Sea
By John E. Randall, Gerald R. Allen and Roger C. Steene. 1991. University of Hawaii Press, Honolulu, Hawaii. 564 pp. ISBN 0-8248-1346-4. US$60.

This superb, albeit large size, guide book written by Jack Randall and Gerald Allen, is illustrated by the stunning underwater photographs of Roger Steene and some beautiful fish paintings by Roger Swainston. Information on more than 1100 species, approximately 95% of the known fishes in the region is presented, some of which have been poorly known up to now.

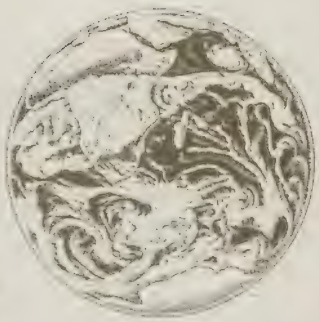
Following the style of some of the previous books by Randall, the book contains a map of the area, a general introduction, and family and species descriptions. There is a quick reference guide to 106 families at the beginning of the book. The introduction outlines some of the features of a coral reef, the study area, some of the threats it faces and some of the measures that have been taken by the authorities to protect this heritage. In addition, some of the species listed are widely distributed in the tropical oceans, thus the book will be also useful outside its intended geographical range.

Information is summarized for each family and in turn, details of individual species, in alphabetical order, are given such as common and Latin names description, distinguishing characteristics, distribution, some information on habitat preferences and abundance, and synonyms. For species with morphologically different phases (male/female, or young/adult) separate photographs are included to aid in their identification. It would however, have been useful to add subheadings throughout the text to make it easier for the reader to find information on specific topics.

Up until recently, the most easily available information on marine and coral fishes has been restricted to commercial species. Now there is a growing awareness of the plight of marine fishes, in particular, those species that occur in the aquarium trade. Therefore, it would have been extremely useful to find more information on abundance as well as status in the wild, especially for those species which occur in the aquarium trade, as we can no longer assume that marine fishes are safe just because they occur in such a vast area. However, I feel that the lack of this type of information in a book of this kind rather reflects our current state of knowledge regarding marine fishes in general. Considerable efforts are currently being made by various international groups to address this situation. Nevertheless, this new publication is extremely timely and makes a significant contribution to our present knowledge of coral reef fishes world-wide.

Patricia Almada-Villela, Ph.D.
Consultant in Conservation and Aquatic Biology, Willingham, U.K.

A North American Free Trade Agreement: The impacts on wildlife trade.
By Debra A. Rose. 1991. Traffic USA, World Wildlife Fund, Washington, D.C. Vol. 1: 1-38, 2: appendices 1-13. (Order from: WWF Publications, P.O. Box 4866, Hampden Post Office, Baltimore, Maryland 21211, U.S.A., Tel: (410) 516-6951).



The principal findings are: A North American Free Trade Agreement (NAFTA) is likely to increase wildlife trade. NAFTA will likely increase pressure to exploit North American wildlife resources and will increase wildlife trade monitoring and enforcement needs. The U.S. government currently has no specific plans to increase its wildlife enforcement capability along the U.S.-Mexico border, despite the potential increase in wildlife trade with NAFTA. Exotic leathers and leather products will be the area of wildlife trade most directly affected by NAFTA. Recommendations are made in regard to the regulation of wildlife trade, especially between U.S. and Mexico, and to better inform U.S., Canadian and Mexican citizens travelling abroad, about the regulations governing purchase and import of wildlife specimens and products.

Delta, Newsletter of the Canadian Global Change Program / Bulletin du Programme canadien des changements à l'échelle du globe.
Published in English and in French by The Canadian Global Change Program, c/o the Royal Society of Canada, P.O. Box 9734, Ottawa, Ontario K1G 5J4, Canada. ISSN1180-1859
The Canadian Global Change Program (CGCP), under the directorship of Dr. Brian D. Bornhold, provides a national focal point for Global Change Activity in Canada. It represents a broad and multidisciplinary network for coordinating research and communicating results, ideas and recommendations to the policy community. This review summarizes biodiversity-oriented material in the Winter 1991 issue of their newsletter, Volume 2, Number 2. The first article treats potential health impacts of global change. Climatic warming may increase the incidence of malaria and rabies by permitting extension of range of the insect and bat vectors of these diseases. Increased ultra-violet radiation may affect human
food supplies and health because of their effects on pollen grains and plankton. The newsletter announces that a proceedings and summary document are being prepared for the CGCP October 1991 Assembly "Sustaining Land Use: The Challenges of Global Change for Western Canada" that focused on agricultural and forestry land use. A Resent Research Planning column announces a plan for Canada-USSR Research on the Treeline and the Canadian Long-term Ecosystems Research Program on biological impacts of environmental processes and trends in Canada. The Canadian Climate Program Research Committee met and discussed the Global Climate Observing System; a task force was struck to develop long-term support for this sort of monitoring. Awards of the Stockholm Water Prize to Dr. David Schindler for his work on the Experimental Lakes Project near Kenora, Ontario and of the Swedish WASA Environmental Award to Jim MacNeil, for his work as Secretary-General of the Brundtland Commission and Environment Director for the Organizations for Economic Cooperation and Development, were reported. Subscriptions to this informative newsletter can be arranged by writing to the above address.

Effectiveness of mid-ocean exchange in controlling freshwater and coastal zooplankton in ballast water.
By A. Locke, D.M. Reid, W.G. Sprules, J.T. Carlton and H.C. van Leeuwen. 1991. Canadian Technical Reports of Fisheries and Aquatic Sciences Number 1822.
Of ships carrying ballast water 89% in the St. Lawrence River and Great Lakes are complying with mid-ocean ballast water change. Effectiveness of ballast water exchange in eliminating live freshwater zooplankton from ships originating in freshwater ports is 67%.

The expendable future: U.S. politics and the protection of biological diversity
By R.J. Tobin. 1991. Duke University Press, Durham, North Carolina. 325 pp. US$18.75 (paper).

Evaluation of biodiversity politics and federal policies on endangered species during the last 30 years. Coverage includes resources and priorities, administration, listings, preservation, costs, cooperation amongst agencies, and assessing performance.

Kuwaiti plants: Distribution, traditional medicine, phytochemistry, pharmacology and economic value.
By B. Biddleditch and A. Amer. 1991. Elsevier Science Publishers, Amsterdam, The Netherlands. 322 pp.

State of the world 1992
By L. Brown *et al.* 1992. Worldwatch Institute, Washington, D.C.

Directory of country environmental studies
By Center for International Development and Environmental Studies. 1992. World Resources Institute, Washington, D.C. 200 pp.

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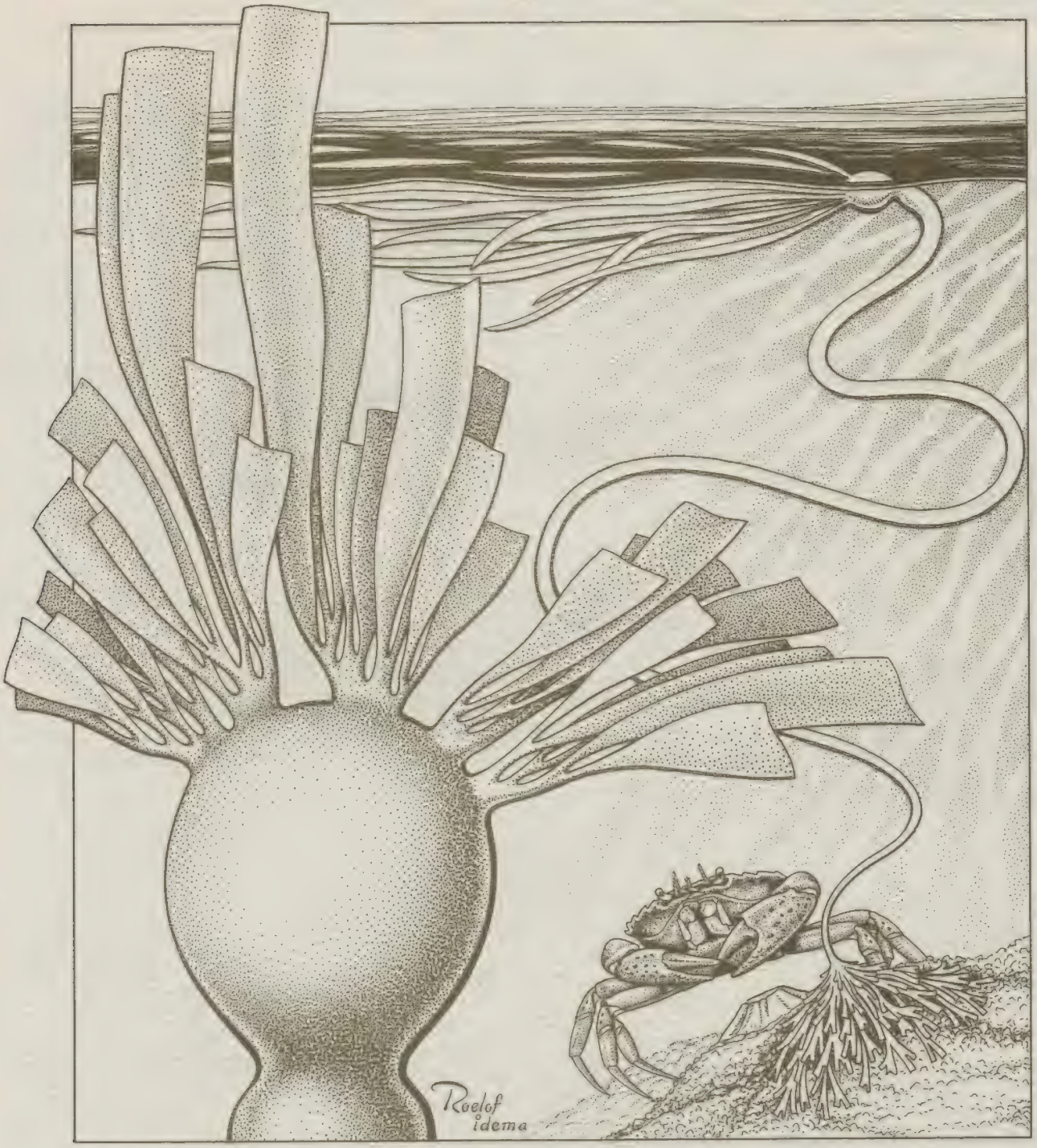
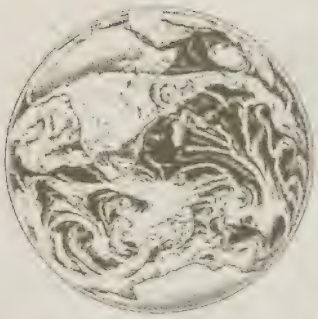


Illustration of Bull Kelp, *Nereocystis leutkeana*.
Canada's west coast has the world's highest diversity of kelps. Both bull kelp and giant kelp, *Macrocystis integrifolia*, are key components in a complex ecosystem that is found from northern British Columbia to California. Kelp forests have a higher carbon fixation rate, and hence growth rate, than tropical rainforests. They are home to thousands of species that live on top of, in and around the kelp plants, from attached algae and protists to crabs, sculpins, mergansers, sea lions and humpback whales.



The conservation of insects and their habitats
By N. Collins and J. Thomasa. (Editors). 1991. Academic Press, San Diego, California. 450 pp.

Sustainable developement: A manager's handbook
By D.W. Conklin, R.C. Hodgson, and E.D. Watson. 1991. National Roundtable on the environment and Economy, Ottawa. 138 pp. ISBN 1-895643-00-7.

Decision making practices for sustainable development
National Roundtable on the Environment and the Economy, Ottawa. 1991. 134 pp. ISBN 1-895643-05-8.

The National Roundtable on the Environment and the Economy (Ottawa, Canada) has recently published a series of five handbooks on sustainable development. The series includes the two books reviewed here, as well as the following: **Preserving our world, The national waste reduction handbook**, and **On the road to Brazil: The Earth Summit.**

Sustainable development: A manager's handbook is the first book of the series, intended to bring to the attention of corporate managers their role in ensuring a dialogue among themselves, environmentalists, consumers and government agencies and the new legislative framework in which we must all now operate. The book is divided into three easy-to-read and to understand sections. Part A covers the new awareness of sustainable development and why businesses should be concerned and how they **can** make a difference. Each of us **can** indeed make a difference. The book is replete with quick facts about our environment, and how corporations (and individuals) have affected the present crisis situation. One quick fact, for example, notes that "do-it-yourself mechanics in North America spill more oil **each year** than the *Exxon Valdez*"! A fact I find startling. Part B is a series of 20 questions intended to score organizations on their "environmentally friendly" corporate policies. One question I found interesting was, "Do you undertake research to reduce environmental risks?" How many companies or organizations could today answer "yes" to that question? How many will so have to answer "yes" as a means to remain competitive and insure future profits?

The final section details several methods on "How can you do better?" including a management strategy and employee involvement program, which can help in corporate planning. Finally, the handbook closes with a few success stories of companies, whose practices of sustainable development have achieve positive results for the organization **and** the environment, e.g. Dow Chemical Canada; Loblaw's 'Green Product Line'; etc. The final word in the handbook is given by the sponsor of this volume - The Royal Bank of Canada: "Sustainable development will not be achieved, and economic and environmental problems will not be solved, through rhetoric or endless confrontation. Our best weapons are co-operation, hard work and common sense."

Decision making practices for sustainable development seems to me to be a valuable tool for the manager; a book long overdue. This handbook comprises eight chapters covering management tools, strategies, problems, the decision-making process, and, most importantly, a review process. Of special note is the Code of Practice (Chapter 6), which accounts for about 40% of the book. This chapter is a checklist involving 23 topics based on principles and guidelines of sustainable development. Not all the questions within the checklist are applicable to all individual businesses. But a quick review of the questions is revealing and leads on to other questions concerning corporate practice and the environment.

The Code of Practice reproduced in this handbook was developed by the Manitoba Round Table on Environment and Economy and designed to involve senior management in sustainable development action, encourage a review of existing practices, identify areas needing improvement, educate employees, and to "demonstrate public commitment to sustainable development."

Proctor and Gamble, Incorporated, sponsored this handbook, and, like the previous handbook, was given the last word. Proctor and Gamble is an environmentally conscious corporation which has been successful in adopting programmes aimed toward sustainable development. They note that, "In Canada, and around the world, companies will come under increasing scrutiny for their environmental ethics."

I strongly urge institutions, businesses and organizations to read these handbooks, and to prepare a Code of Practice to suit their particular needs and the needs of the environment. To do this, and to do this now, will aptly prepare these organizations for a "scrutiny of their environmental ethics."

David M. Jarzen
Canadian Museum of Nature, Ottawa, Ontario

The state of Canada's environment
By Environment Canada, 27 chapters, 500 color maps, in English or French. Obtainable from: Canada Communication Group, Ottawa, Ontario K1A 0S9, Canada, or call (819) 956-4802. $29.95.

The Bottlenose Dolphin

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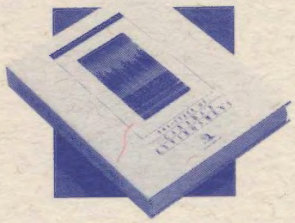
Protecting the environment is key to our survival.

FACT:

To protect the environment we must be informed.

FACT:

Being informed requires that we know all the facts.



THE · STATE · OF

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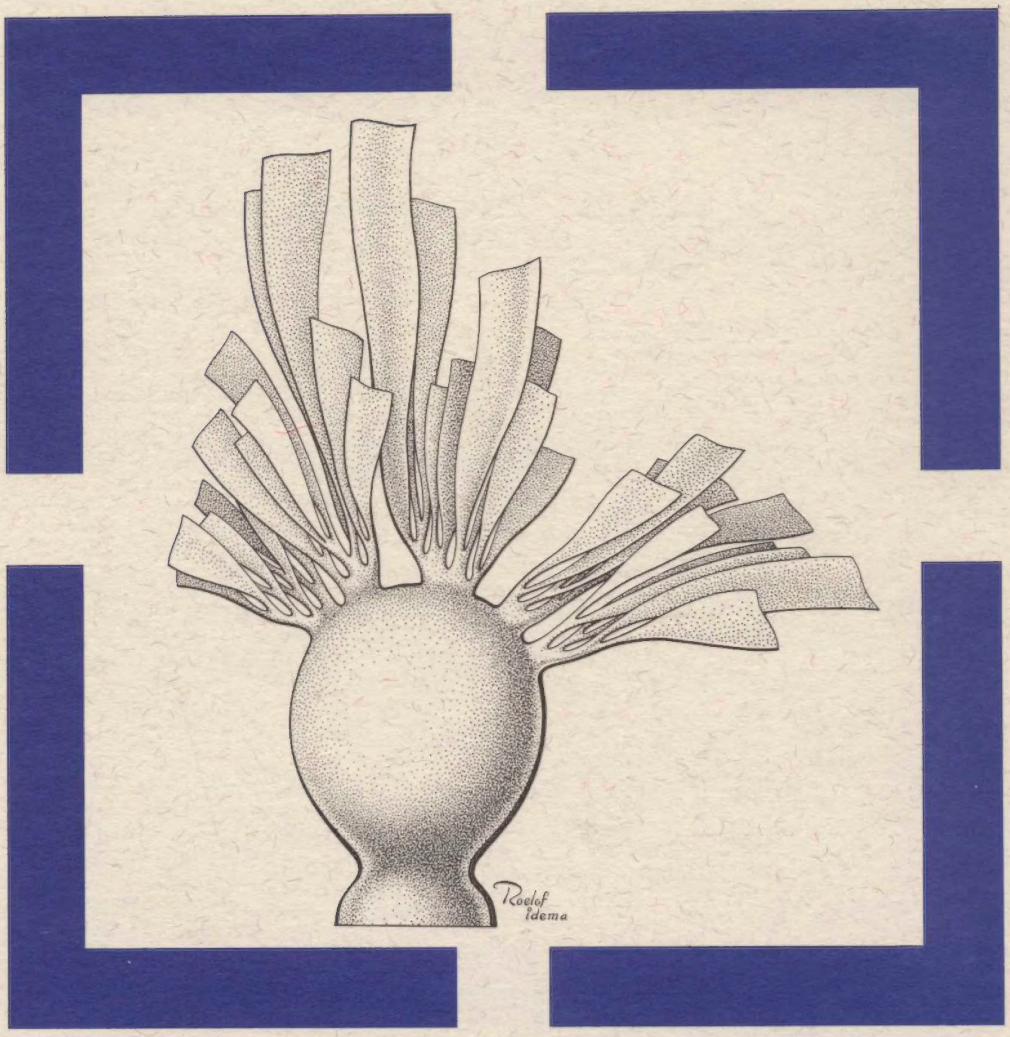
ISSN 1183-3254 (English Edition)
ISSN 1183-3378 (edition française)



If life on earth were to survive, not a single man, plant, bird or mammal must be allowed to lose its life except through some great necessity of life itself. And in the losing all men should join in with every plant and animal and bird to praise it and mourn its passing as that of something infinitely precious that had given life the service for which it had been conceived and rendered itself well.

Laurens van der Post. 1974. *A far off place*. Clarke, Irwin and Company Ltd., Toronto. 311 pp.

Published by:
Canadian Museum of Nature
P.O. Box 3443, Station D
Ottawa, Ontario K1P 6P4, Canada